American Machinist

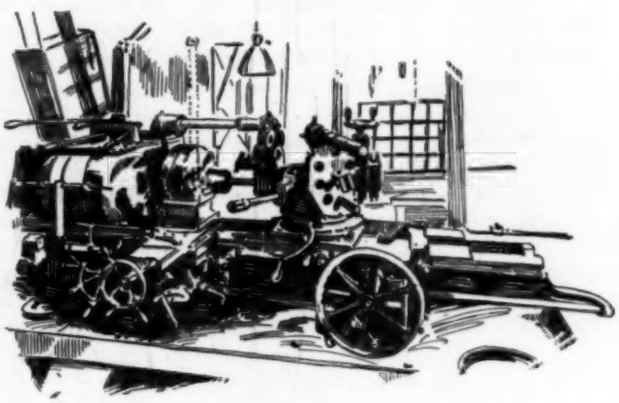
A McGraw-Hill Publication. . . Established 1877

New York, November 7, 1929

*

What

OBSOLETE EQUIPMENT Costs



Three electrical equipment plants are banking annual aggregate savings of $19,850, earned through three pieces of modern equipment

IN THE very first article of this series (Vol. 70, No. 20) we considered how much it is costing a certain unnamed railroad company to keep obsolete equipment in service. By three familiar formulas—the Warner and Swasey, the SKF, and the A.S.M.E.—we calculated that the lack of a modern turret lathe cost them almost the full price of a new lathe each year; a duplex miller, costing $8,925, replacing a standard No. 5, would earn them from $6,600 to $12,025; and a new vertical turret would return them an annual 50 per cent dividend on its purchase price. Why the railroad management scotched the requisition for these three tools is still a mystery.

In the second article (Vol. 71, No. 1) we were even more at a loss to comprehend the machine-tool policy of a machine-tool plant. Though a shoemaker's child is notoriously barefooted, we were hardly prepared to find a management which refused to buy a modern $6,000 internal grinder which would earn from $4,400 to $6,850 annually and would do more accurate work, and rejected a money-saving duplex miller as well as a station-type, vertical, automatic chucking machine which would more than pay for itself every two years. That this management chose this negative policy must have been a very real surprise to many a reader.

Again, in this third article on "What Obsolete Equipment Costs," we shall apply the three formulas to three specific cases, but we shall consider tools which have been in actual, profit-making operation in three electrical equipment plants. We are indeed even fortunate enough to be able to give actual performance figures for two of the tools so that the reader may check them against the formula figures. Once more we suggest that the reader make his own choice of the formulas in analyzing his own equipment problems and future purchases. All three have amply proved their reliability and usefulness.

Eight Operations on One Turret Lathe

Case one covers a modern turret lathe which replaced an older slower turret of another make. In an average time of 11.25 minutes it is now doing the first chucking on a cast-iron commutator sleeve which required 39.75 minutes on the older machine. Each piece is given a rough bore, a finish bore, a ream, a rough turn, a finish turn, a rough groove, a finish groove, and a facing. Both the old time and the new are based upon a 48-minute hour. Set-up time is averaged and included.

According to the Warner and Swasey formula, we assume a standard labor cost of 60 cents per hour, plus 90 cents per hour for overhead, a total of $1.50 per

hour or 2½ cents per minute, and find:

Former cost per piece = 39.75 × 2½ = $0.99375
Present cost per piece = 11.25 × 2½ = $0.28125

Gross saving per piece = $0.71250

Based on an 8-hour working day and 280 days per year, the gross savings per year will be found to be 42.67 (pieces per day) × 280 (days) × $0.7125 = $8,512.

Cost of new turret lathe = $4,297.
Cost of special tooling = $ 90.

= $4,387.

To arrive at the actual savings we must deduct interest on the investment and depreciation. This we lump at the conservative figure of 20 per cent.

20 per cent depreciation on lathe = $859.
100 per cent depreciation on special tooling = $ 90.

Total depreciation = $949.

Therefore $8,512 minus $949 gives net annual savings of $7,563. This 172 per cent annual saving should not be too unwelcome. It should be noted, moreover, that the Warner and Swasey method does not consider the second-hand value of the old machine. Though it were only $200 it would raise the percentage of annual savings by reducing the net investment figure.

The SKF formula, on the other hand, incorporates the value of the old machine. It will be remembered that it seeks to show the number of months in which new equipment will pay for itself, rather than an annual savings figure. This figure must be calculated separately. The SKF formula is this:

$$M = \frac{C_E + C_T + C_{IX} + C_{DX} + V_B}{(R_P - R_E) N_D D_M + S_{OHM}}$$

M = the number of months in which the equipment will pay for itself
C_E = the cost of the new equipment
C_T = the cost of tooling the new equipment
C_{IX} = the cost of interest for X years at 6 per cent, X equaling the number of years determined upon as the maximum time during which the equipment must pay for itself
C_{DX} = the cost of depreciation for X years at 10 per cent, X having the same value as above
V_B = the book value of the displaced equipment
R_P = the present rate (cost) per piece
R_E = the estimated rate (cost) on the new equipment
N_D = the number of pieces to be produced per day on the proposed equipment
D_M = the number of working days per month
S_{OHM} = the savings in overhead per month.

It will be realized that we shall use an actual figure for R_E and the old cost for R_P. We shall assume again that the new equipment is to be written completely off in five years. Then

C_E = $4,297.00
C_T = $ 90.00
C_{IX} = $1,289.10 (Interest at 6 per cent for 5 years)
C_{DX} = $2,148.50 (Depreciation at 10 per cent for 5 years)
V_B = $ 200.00
R_P = $ .99
R_E = $ .28
N_D = 42.67 (pieces)
D_M = 24 (days)
S_{OHM} = 0 (Included in calculation of rate per piece).

Thus M =

$$\frac{\$4,297 + \$90 + \$1,289.10 + \$2,148.50 + \$200}{\$0.71 \times 42.67 \times 24 + 0}$$

$$= \frac{\$8,024.60}{\$\ 727.20}$$

= 11⅓ months in which the equipment will pay for itself.

To calculate further, we find a net saving of $387 per month and $4,644 per year, 105.8 per cent annual return on the investment. Though the figures shown by this formula are not as high for this tool as the figures shown by the Warner and Swasey method, they are amply high to give the electrical manufacturer a comfortable and prosperous feeling. This manufacturer, unfortunately, keeps no record of individual machine performance, and we cannot check formula figures against actual practice.

By the more complicated A.S.M.E. formula we find indicated savings of 150.6 per cent. In this double formula we have the following symbols:

A = interest rate, or yearly allowance on investment
B = yearly percentage allowance for insurance, taxes, etc.
C = yearly percentage allowance for upkeep
E = yearly cost of power, supplies, etc., in dollars
h = expected number of years of life of equipment
I = initial cost of new equipment, in dollars
K = unamortized value of equipment displaced, less its scrap value, in dollars
X = percentage of year during which equipment will be in use
S = yearly saving in direct labor cost, in dollars
T_a = yearly saving in labor burden, in dollars
T_b = yearly fixed charges on old equipment, in dollars
U = yearly saving or earning through increased production, in dollars
Y = yearly cost to maintain new equipment ready for operation, in dollars (fixed charges)
V = yearly net operating profit from new equipment, in excess of fixed charges, in dollars

And the symbols have the following values:

A = 0.06 B = 0.01 C = 0.05
E = 0 h = 5
I = $4,387
K = $200
X = 0.90
$S + T_a$ = $8,512
T_b = $400
U = 0.

The formula for

$$Y = I\left(A + B + C + \frac{1}{h}\right)$$

$$= \$4{,}387(0.06 + 0.01 + 0.05 + 0.20)$$
$$= \$4{,}387 \times 0.32$$
$$= \$1{,}403.84 \text{ fixed charges.}$$

$$V = [(S + T_a + U - E)X + T_b] - \left[Y + K\left(A + \frac{1}{h}\right)\right]$$

$$= [(\$8{,}512 + 0 - 0)0.90 + \$400] - [\$1{,}403.84 + \$200(0.06 + 0.20)]$$

$$= \$6{,}604.96 \text{ yearly net operating savings.}$$

Whatever way it is looked at, and whichever formula is used, the savings from this modern turret lathe cannot be gainsaid.

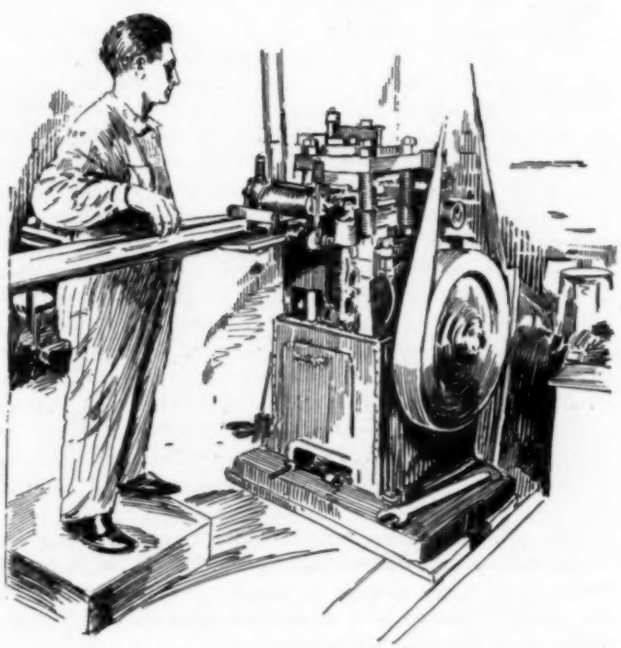
Major Savings on Minor Parts

Case two has been selected deliberately to show the major savings which can sometimes be made on minor parts. Here we find an electrical manufacturer producing small transformer laminations on five 25-ton dieing machines at a rate which would require a battery of 13 hand-fed punch presses. The material is a 3 to 3½ per cent silicon steel of No. 26 gage. The finished laminations are simply square-cornered pieces from 3x3¼ to 4x5 in. in size. Since one man feeds two machines (he secures an average of 16,150 laminations per machine per hour out of a possible 16,200!) we have adjusted the figures to compare his work with that of the displaced punch-press operator.

The old production rate on punch presses was 6,000 per hour, two pieces to a die, but the rate fell frequently to 3,500 and below. Taking the high we find 1,000 laminations produced in 10 minutes. At 16,000 per hour on one dieing machine, 1,000 laminations are produced in 3.75 minutes. These figures allow amply for die setting, grinding, and adjustment. Dies used are the same for both machines and are, therefore, not considered in the calculations.

Using the Warner and Swasey method we find:

Former cost per 1,000 pieces = 10 min. × 2½ = $ 0.25



Present cost per 1,000 pieces = 3.75 min. × 2½ = $ 0.09

Gross saving per 1,000 = $ 0.16

Gross savings per year
132 (M per day) × 280 × $0.16 = $5,915.60

Cost of dieing machine = $1,981.35

Special Tooling None

Total investment = $1,981.35

Depreciation on investment (20 per cent) = $ 396.27

Gross savings minus depreciation = $5,519.33
or 278.6 per cent on the investment.

The SKF formula gives 160 per cent when the following values are assigned the symbols:

C_E =	$1,981.35	R_P =	$ .25
C_T =	0	R_E =	$ .09
C_{IX} =	$ 594.40	N_D =	132
C_{DX} =	$ 990.68	D_M =	24
V_B =	$ 200.	S_{OHM} =	0

S_{OHM} is included in the calculation of the rate per 1,000 pieces.

Thus

$$M = \frac{\$1{,}981.35 + 0 + \$594.40 + \$990.68 + \$200}{\$0.16 \times 132 \times 24 + 0}$$

$$= \frac{\$3{,}766.43}{\$\ 506.88}$$

$$= 7.5 \text{ months.}$$

Divide $1,981.35 by 7.5 months and we find monthly savings of $264.15 or $3,169.80 per year.

By the A.S.M.E. formula, on the other hand, we secure a net return on the investment of 254 per cent, almost equal to the estimate by the Warner and Swasey formula. Here the symbols have the following values:

$A = 0.06 \quad B = 0.01 \quad C = 0.05$
$E = 0 \quad h = 5$
$I = \$1{,}981.35$
$K = \$200$
$X = 0.90$
$S + T_a = \$5{,}915.60$
$T_b = \$300$
$U = 0.$

Then $Y = \$1{,}981.35\ (0.06 + 0.01 + 0.05 + 0.20)$
$= \$634.03$ fixed charges

$$V = [(\$5{,}915.60 + 0 - 0)0.90 + \$300] - [\$634.03 + \$200(0.06 + 0.20)]$$

$$= \$5{,}037 \text{ yearly net operating savings.}$$

As previously suggested, we have actual figures to check against the $5,519, the $3,169, and the $5,037 of the three formulas. They are enlightening:

Efficiency of dieing machine	= 99.7 per cent
Efficiency of old presses	= 71.4 per cent
Production increase	= 169 per cent
Die life increase	= 59.1 per cent
Total die cost decrease	= 18.9 per cent
Savings effected (per machine per year)	= $3,962.00

More enlightening is the thought that dies should last longer at 135 strokes to the minute on the dieing machine than they did at 70 on the punch press. The actual operating records show 600,000 strokes between regrinds

against a former 480,000, and total life of 8,400,000 strokes against 5,280,000. The answer naturally lies in the greater ruggedness, stability, and lack of spring in the new machine. Even die grinding becomes less costly through greater accessibility, $6 per die against a former $7.50.

Die Savings Pay for New Machine

For case three we have selected another dieing machine in another electrical plant. This 50-ton machine produces rotor and stator laminations for electric motors on dies which are interchangeable with those of No. 5 punch presses used formerly for the entire production. Each stroke of the press gives one rotor and one stator, the dies being of the progressive type doing four operations at once. The first two operations blank and remove the rotor, the next two blank and remove the stator. Old production averaged 1,818 sets per hour, 1,000 per 33 minutes; new production averages 5,500 per hour, 1,000 per 10.9 minutes, actual time including die changes, set-ups, and machine servicing.

According to the first formula:

Former cost per 1,000 = 33 min. × 2½ =	$ .825
Present cost per 1,000 = 10.9 min. × 2½ =	$ .273
Gross saving per 1,000 =	$ .552
Gross saving per year = 44 (M per day) × 280 × $0.552 =	$6,800.64
Cost of dieing machine complete =	$3,450.
Depreciation at 20 per cent =	$ 690.
Gross savings minus depreciation =	$6,110.64

or a net annual return of 177 per cent.

The depreciation charge of 20 per cent is manifestly unfair to this machine, because it has been in daily operation for over 8 years at a total repair cost of under $50 per year and shows no signs of decrepitude or old age.

By the SKF formula we find:

C_E = $3,450	R_P = $0.825
C_T = 0	R_E = $0.273
C_{IX} = $1,035	N_D = 44
C_{DX} = $1,725	D_M = 24
V_B = $ 200	S_{OHM} = 0.

Thus

$$M = \frac{\$3,450 + 0 + \$1,035 + \$1,725 + \$200}{\$0.552 \times 44 \times 24 + 0} = 11 \text{ months.}$$

The savings figure $313.64 per month and $3,763.68 per year, net savings on the investment of 109 per cent. This is considerably less than the result through the Warner and Swasey formula.

But the A.S.M.E. formula gives another figure again, using these values:

$A = 0.06$ $B = 0.01$ $C = 0.05$
$E = 0$ $h = 5$
$I = \$3,450$
$K = \$200.$
$X = 0.90$
$S + T_a = \$6,800.64$
$T_b = \$300$
$U = 0$
$Y = \$3,450\ (0.06 + 0.01 + 0.05 + 0.20)$
$= \$1,104$, fixed charges
$V = [\ (\$6,800.64 + 0 - 0)\ 0.90 + \$300] - [\$1,104 + \$200\ (0.06 + 0.20)]$
$= \$5,264.58$, or 152.6 per cent on investment.

So much for the formulas and their results. The actual figures on this 50-ton machine are almost startling; from die-savings alone this electrical plant realizes $7,465 per year, a cost reduction of $0.57 per thousand pieces, and an average annual saving of more than 200 per cent of the cost of the dieing machine complete.

Other actual figures are almost equally startling. Because machine-tool formulas do not contemplate certain elements which enter into dieing practice, it really is not entirely fair to use them for yardsticks. At that, the annual savings other than die-savings have run $3,779, total savings being $11,244 averaged over a period of years. Net annual return on the investment is 314 per cent.

Were these three machines, the turret lathe and the two dieing machines, located in one plant (and they could very well be) the fortunate management would be showing proud and prosperous directors a total yearly saving of $4,644 + $3,962 + $11,244 = $19,850. Their investment would be $4,387 + $1,981 + $3,450 = $9,818. $19,850 constitutes an annual return of over 200 per cent. Truly a good round sum!

The editors of *American Machinist* admit that these three cases are exceptional. But they submit, and reiterate, and insist that carefully considered purchases of modern machine tools and equipment will bring far greater and sounder returns than speculative corporation loans in the present or any other call money market. What Obsolete Equipment Costs American Industry will never be known accurately, but the sum total of material and monetary losses must indeed be staggering.

THE foregoing article is the third in the series "What Obsolete Equipment Costs." The first appeared in Vol. 70, No. 20, and the second in Vol. 71, No. 1. The next article will appear in an early issue. Meanwhile the editors will welcome actual figures showing concrete cases of what Obsolete Equipment costs, or would have cost had new equipment not been bought.

Making Gages to Specified Tolerances

By J. T. Towlson
Silvertown, London, England

NOT long ago the manager of a plant manufacturing plastic parts placed an order for a quantity of plug and snap gages. The dimension called for on both types of gage was 0.379-in. In making the gages, because of the fact that only a single dimension was given, care was taken that the plug gage should not be under, or the snap gage over, 0.379-in. The toolroom foreman was informed later that the gages were unsatisfactory because they did not fit together like other gages the customer had. The question then arose whether the foreman was correct in following his orders as written, or whether he should have made the gages fit regardless of the dimensions given. The foreman contended that the product checked by the gages would go together perfectly until they wore, because he had left the one small and the other large, but he also contended that the buyer should have specified 0.379 minus 0.0005-in. for the snap gage, and 0.379 plus 0.0005-in. for the plug gage. The matter of mating tolerances is still a puzzle to many people.

The practice of the uninformed in ordering gages in terms of definite dimensions, and insisting upon having them made that way is a common occurrence, but it illustrates the need of a dependable shop language and a wider knowledge of tolerances.

Set-Ups for Plymouth Crankshafts

Straight line arrangement of equipment provides for an output of 500 crankshafts in eight hours

BY FRANK W. CURTIS

MOTORS for Plymouth cars, produced by the Chrysler Corporation, are of the four-cylinder type, with the conventional form of crankshaft, and the majority of operations follow the usual mass production methods. The equipment for machining it is laid out for straight-line production on the basis of 500 finished crankshafts each eight hours.

The first operation is the milling of the sides and top of the two locating lugs on the webs of the shaft. The next operation is the turning of the fillet and the cheek of the No. 1 line bearing, the gear fits, the fillet and cheek of the flange, and the oil slinger. In the same set-up, the flange is faced with straddle tools, the center-bearing is rough formed, and the sides of the cheeks faced down. All these operations are performed in a crankshaft lathe equipped with a center driving head. The rough crankshaft forging is received at the machine, with center holes drilled at each end. The production per machine is approximately twelve pieces per hour, and a total of six machines are used for the operation.

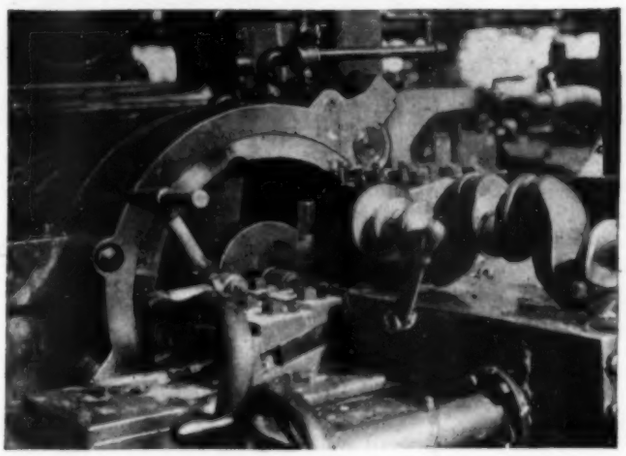


Fig. 1—A center-drive crankshaft lathe in which the main bearing and other diameters of the crankshaft are rough turned

Fig. 2—Various straightening operations required during manufacture are done in power presses such as the one pictured

After the crankshaft leaves this machine, it is inspected for alignment and straightened if necessary. This, and subsequent straightening operations required during manufacture, are done in power presses such as the one shown in Fig. 2. The work is supported on V-blocks and is revolved by the operator so that the concentricity can be checked by an indicator gage. Movement of the straightening ram is controlled by a treadle so that any desired pressure can be applied.

All the pin bearings are rough turned at one setting to 1.990-2.000 in. in the crankshaft lathe shown in Fig. 3. In this case, the crankshaft is supported by two pot-type fixtures which grip the work on the previously-turned front and rear bearing surfaces. There are six machines of similar construction used for this operation.

After leaving this machine the crankshaft is again straightened, and is then ready for a series of grinding operations, which include the finishing of all bearings, gear fits, and thread diameters, as well as the hand pulley fits, thread diameter, and the felt fit. A driving head finish grinds the pin bearings. The work is held by the end bearing, rests on a formed locating block, and is clamped by a swing-type clamp. A setscrew is used to align the work radially where it bears against one of the locating lugs. When the work is clamped in the fixture, the center line is 2.125 in. above the center line of the machine. To provide for any inaccuracies that may develop in the fixture, the body is made with an adjustment that is regulated by a graduated screw.

A cylindrical-type machine, such as is shown in Fig. 4, is used for grinding the front end bearing. This operation includes not only the grinding of the diameter, but also the grinding of the cheek face in relation to the cen-

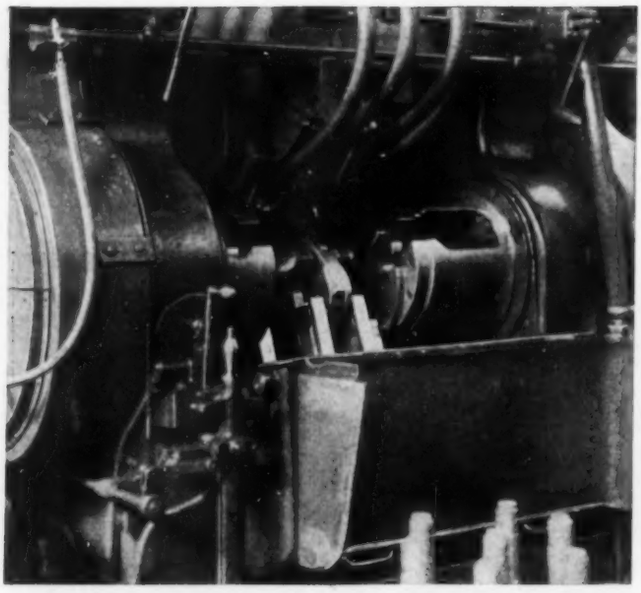


Fig. 3—The pin bearings are rough turned at one setting to 1.999-2.000 in. in this crankshaft lathe

ter bearing. A built-up snap gage is used to check this latter dimension, while a limit snap gage is used for checking the main bearing diameter. In addition, the machine is equipped with an indicator-type grinding gage so that a reading on the diameter can be taken while the work is in motion.

Succeeding operations include drilling, threading, and milling. The drilling of the $\frac{25}{32}$-in. hole in the front end of the crankshaft is done in an indexing fixture, Fig. 5, having nine work-holding stations. Three holes are drilled part way, then completed at the next station. The flange end of the work is centered by a spring center, as shown at *A*, and by a V-block *B* which fits the end diameter. Radial alignment is obtained by the bracket *C* which has a U-shaped locating block that straddles No. 1 pin bearing. The clamping is done by a series of strap clamps, not shown, each of which is arranged to hold two crankshafts. The indexing locations are aligned by

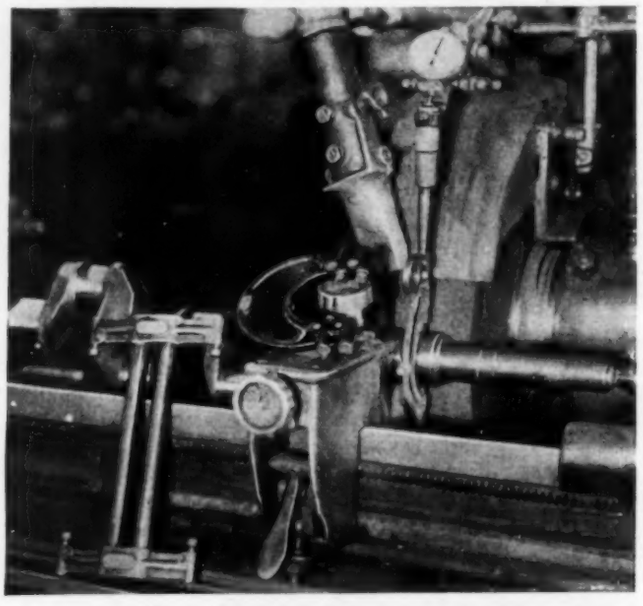


Fig. 4—An indicator-type gage bears on the work while it is in motion. A limit snap gage is also used

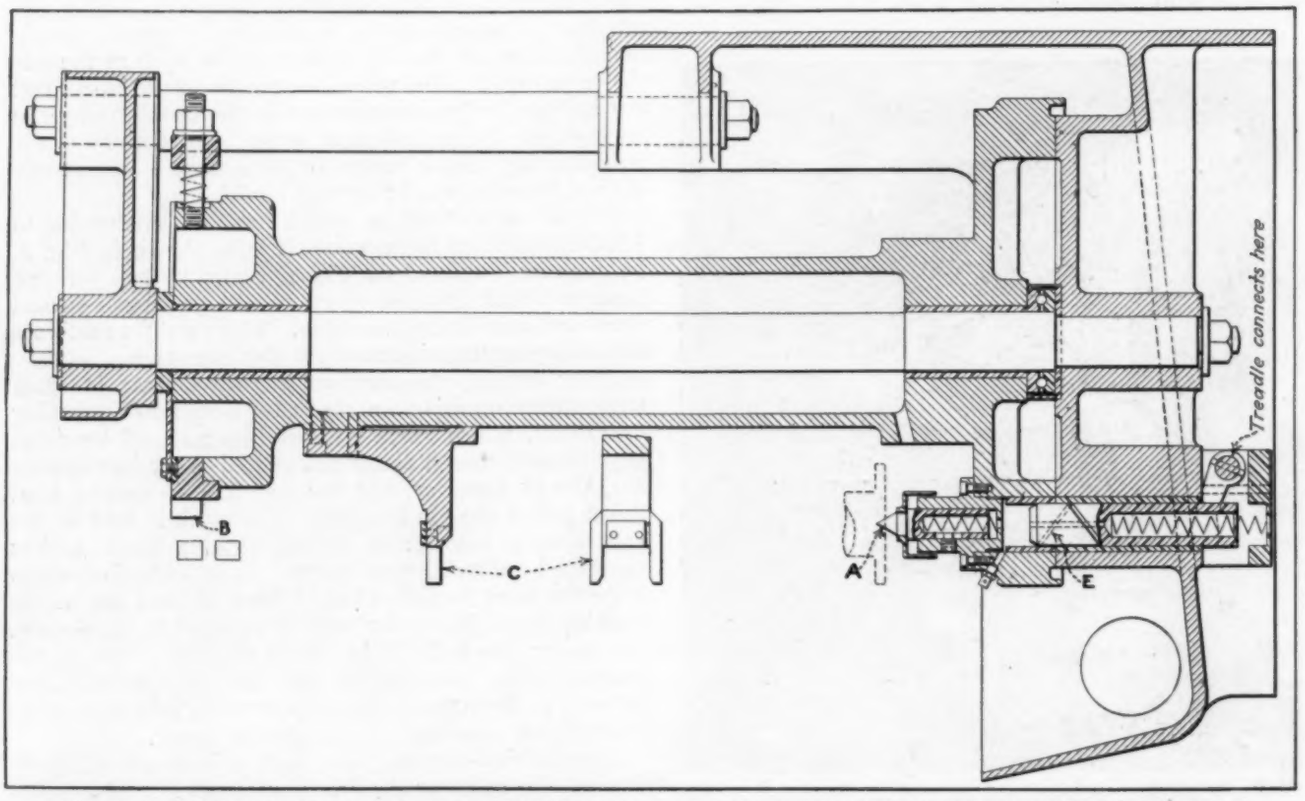


Fig. 5—An indexing fixture having nine work-holding stations is used to drill the $\frac{25}{32}$-in. holes in the front end of the crankshaft. Three holes are drilled part way, then completed at the next station. The work-holding drum revolves 120 deg., and three crankshafts are finished at each indexing

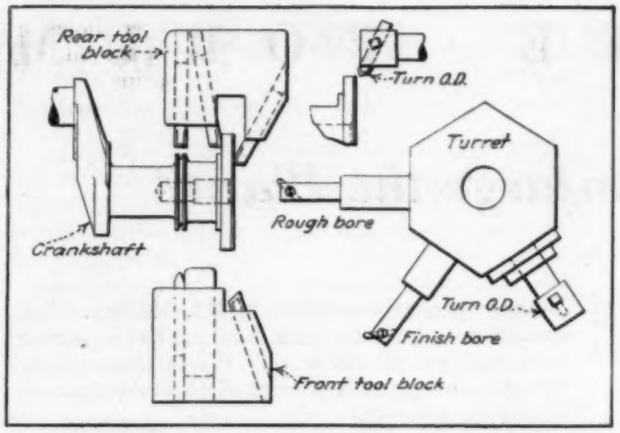


Fig. 6—Machining the back flange end of the crankshaft, showing the set-up on the front and rear tool blocks and the turret tools, together with an overhead tool to turn the outside diameter of the flange

the indexing plunger *E* mounted in the base of the jig, and fitted into bushings located in the rotating member. At each index the work-holding drum revolves 120 deg. so that three crankshafts are finished at each indexing.

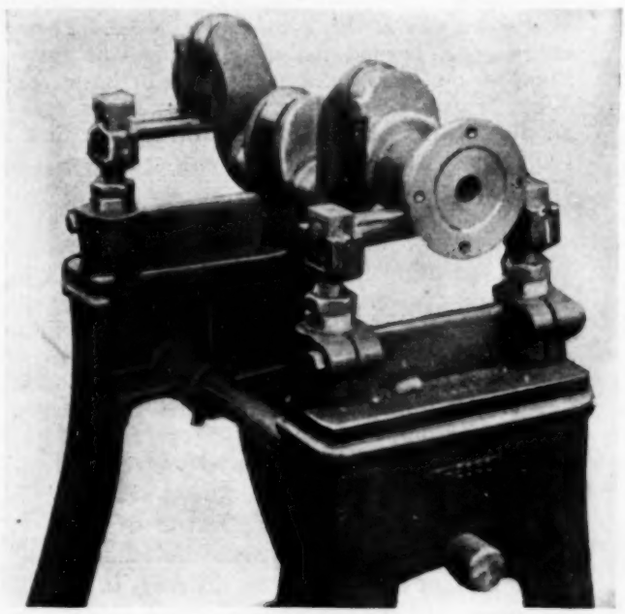


Fig. 8—A simple stand for static balancing

A treadle, located at the right side of the jig base, operates the locating plunger.

In the operation following, the front end is re-centered and faced to length, then two holes are drilled, one $\frac{29}{32}$ in. and the other $\frac{31}{32}$ in. in diameter. In the next operation, the crankshaft is put into a turret lathe, and the flange is faced, turned, and undercut by cross-slide tools, while the turret tools counterbore the flange, and face, bore, and ream the 0.937-in. hole. The tool layout for machining the flange of the crankshaft is shown in Fig. 6. On the rear tool block are mounted three tools, two of which straddle-face the flange while the other one turns the groove diameter. The front tool block also has three tools, one for cutting the groove, another for turning the bearing diameter, and a chamfering tool to break the outside corner of the flange. The boring operations are handled by the turret tools, and an overhang tool is used to turn the outside diameter of the flange.

A patented chuck for use in turning the flanged end of the crankshaft is shown in Fig. 7. The work is clamped by a split bushing, one-half of which is mounted on the stationary portion of the fixture, and the other half on the swinging member. The fixture is equipped with an adapter to suit the spindle of the lathe, and is also provided with a counterweight for balance. The work is located radially between two hardened blocks that project beyond the outer face of the chuck.

After these turning operations, the oil slinger grooves are ground and the outside diameter of the flange is fin-

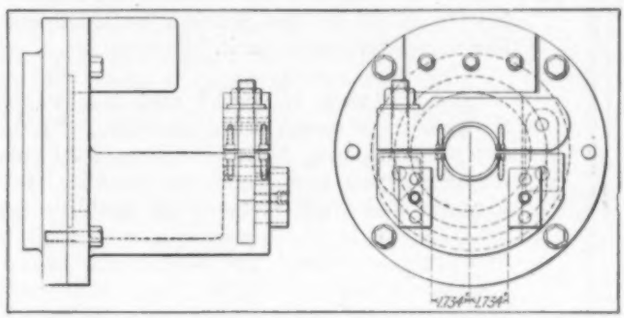


Fig. 7—For the turning operation shown in Fig. 7, the work is clamped in the pot chuck shown above

ish ground. Then the threads, $1\frac{5}{8}$-16 and $1\frac{3}{4}$-16 in., are milled. The keyways for the crank gear and fan pulley are also milled. Other operations include drilling and reaming the flange holes, balancing, finish grinding the face of the flange, hand reaming the four flange holes, polishing the pin bearings and faces of the thrust bearing, washing, and inspection. Fig. 8 shows a stand for check-

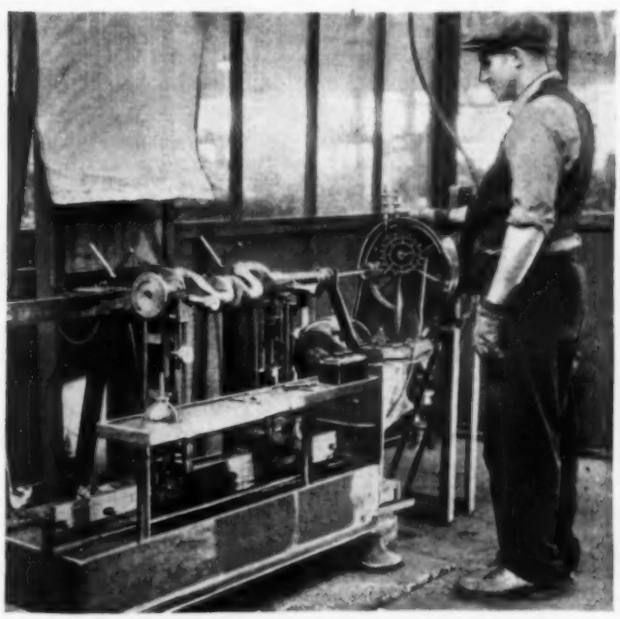


Fig. 9—Final balancing is done on a dynamic balancing machine, that registers the amount of unbalance

ing the static balance of the crankshaft supported on two ways. One of the machines for dynamic balancing is shown in Fig. 9. Three machines of this latter type are needed to balance the number of crankshafts required.

EXECUTIVE · FORUM

Will It Pay to Enlarge the Plant?

"CAN you sit in with us tomorrow, Holland?" asked James Mackey over the 'phone of our counsellor-at-large. "We have a rather serious problem on hand and I'd like to get your slant on it."

"It's this way, Holland," said Mackey, when the group got together the next day. "Jackson, our sales manager, here, is urging us to enlarge the shop so as to increase our capacity at least fifty per cent—he'd rather see it doubled. I'm a bit conservative on the subject, as I don't want to increase overhead and have it staring me in the face if orders slack off for a year or two."

"You've got a real problem, Mackey," replied Holland. "I've always been cautious on the enlargement question myself. But there are times when it is just as necessary as buying new equipment. What are your reasons, Jackson? Can you get business enough to fill a fifty per cent addition?"

"I think we can, Mr. Holland. But the main thing that worries me is that we are losing business because we can't supply machines within a reasonable time."

"I tell him it's often better to let the other fellow take the surplus than to burden yourself with a huge overhead," said Mackey. "Our old customers know our machines, and I'd rather let the new ones go once in awhile."

"If it were only new customers going to other concerns, I might agree with you, Mr. Mackey," spoke up Jackson. "But it isn't. We're losing old ones, too, and that hurts."

"Who, for example, Jackson?"

"Consolidated Pump, Mr. Mackey. I went in to see their P.A. the other day and found he had just placed an order with Bragden. I was sort of flabbergasted, and asked him why, because we'd never even known of the order. The P.A. told me frankly that he'd have bought our machines if he hadn't known how busy we were, and that it meant a wait of from four to six months for delivery. He said there was no use taking our time, or his, in even asking about it."

"But he knows that our machine is better than Bragden's."

"He'd probably admit that, Mr. Mackey. But he also knows the Bragden machine has improved a lot and will do his work. We lost out simply because our plant is too small to build the machines we can sell."

"What do you think about it, Holland?" asked Mackey.

"I'm no Solomon, Mackey. And I sympathize with your idea of not increasing the plant every time you get a few orders ahead. But it looks as though you had been over-cautious, and that you were actually losing good customers of long standing because of too small capacity. Very few businesses can stay at the 'comfortable' stage. They either grow beyond the one-man size, or they slump so that they eventually go out of business. Whether you need a fifty per cent increase is another matter. But it looks as though the time had come to study the question very carefully."

What Do You Think?

Machine tool builders and manufacturers are today faced with the problem of plant expansion. Orders were never so good, deliveries never so poor. But the manufacturer has not forgotten the stinging lesson of the post-war let-down. Shall he enlarge his plant to catch up on orders? If he does, will the big business last? What percentage increase in plant capacity will yield the most economical return?

These questions are so pressing and so practical, and so little up-to-the-minute data is being collected on them, that the information is too valuable to let pass by. Executives struggling with the problem, and those who have battled with it in the past, are urged to present their views and experiences through the Executive Forum.

DISCUSSION

Interesting Men in the Job

While I was connected with a large automobile plant, we were confronted with the question of reducing spoilage of work. The trouble resulted from a lack of interest on the part of the employees.

After considerable study we put into effect a premium system, paying the men additional sums of money at the end of each week in special pink envelopes, in inverse proportion to the amount of spoilage charged against them for the week. The campaign was further aided by moving-picture exhibitions showing close-ups of the mechanical operation of motors, differentials, transmissions, and other parts, work being performed in the different departments, and the way in which one operation tied in with another.

Noonday lectures were given at which assemblies were taken apart and the construction and operation of the individual units carefully explained. Three times each week during the noonhour tours of inspection were made through the shop by selected groups. The executive in charge of the group would explain shop procedures and would answer all questions relating to machine or operations.

Imperfect work had been costing the firm approximately $50,000 annually. The cost of the educational scheme was but $3,500 per year. As a result of the effort spoilage dropped from 27 per cent to slightly less than 4 per cent in five to six months. The plant has doubled its size in the past five years, while the ratio of output has trebled. Men who were formerly critical and careless were so benefited by the educational campaign that many of them were promoted to higher positions and have become boosters.

—F. A. SCHMIDT, *Industrial Engineer, Western Electric Company, Kearny Works.*

Only to the extent to which an employer regards his business primarily as a public service and secondarily as a profit-making concern can he expect his workers to regard it in the same light and to take an interest in their jobs as distinct from their wages. If there is to be a community of interest within the business, it is logical that there should be some organization through which it can express itself. This may be in the form of a factory committee representative of management and workers, in the form of regular foreman's meetings, or of regularly established semi-social functions.

Through these or similar channels, information as to the progress of the business can be given, together with statements as to possible avenues of further progress to answer future needs. Some businesses publish a monthly or quarterly magazine devoted in part to giving this kind of information, and in part to the social and athletic interests of the employees.

Eventually, interesting men in the job implies some sort of share in the management of the enterprise. This share may be an influence in fixing wages and working conditions, in hiring and discharging labor, or in factory discipline. It is difficult to see how it is possible to refuse such a development on the part of the workers without stultifying further efforts at co-operation in production.

—H. JAMES, *Birmingham, England.*

Holland Suggests an Engineering Council

In every manufacturing plan some research program must be instituted with the objective of making and selling a better product at a lower price. In the pursuit of this purpose many questions arise, and they may be settled in one of two ways. Either one man may have the authority to say yes or no, or the decision may be made as a result of group action. The method suggested, calling for an engineering council, is by far the most satisfactory. In this council every department head and executive can present comments, criticisms, and suggestions. Every angle of the problem can be thoroughly considered and the right decision made. Each man can be held more directly responsible for the successful manufacturing of the product, and all will be more eager to carry out the decisions of the council to the mutual benefit of the entire organization.

—L. O. BROWN, *Toolroom Foreman, Holcomb and Hoke Manufacturing Company.*

Neglecting Letters Loses an Order

In the case cited, a company had received a letter from a designer employed by one of the customers, suggesting a wider field of application for the motors which it manufactures. This letter was turned over to the engineering department of the company receiving it, but through neglect it was never answered. The company employing the draftsman heard about the instance and, becoming angry at the impoliteness, began placing its motor orders elsewhere. The loss of the orders caused a showdown in the organization of the motor manufacturer.

Gross negligence and its effect on good will can seldom be so directly checked up as it has been in the case cited. Nevertheless, it is mighty poor business to ignore any correspondence, especially that from customers. Even when ideas offered are obviously wild, if the letters are not answered the story of the impoliteness will eventually reach someone in responsible authority and cause unfavorable reaction. There may be an alibi for failure to recognize the merit of an idea submitted, but a firm that neglects to institute some sort of a system that will assure the answering of all letters is merely advertising to the world that it does not care for advice or suggestions.

—JOHN F. HARDECKER, *Chief Draftsman, Naval Aircraft Factory, Philadelphia.*

The Punch Press

in a Railroad Shop

How one company has utilized the press to manufacture small sheet-metal parts formerly bought or made by hand

RAILROADS, for many years among the chief users of sheet-metal parts, have not until recently realized the economy of manufacturing these parts on a punch press. During the past few years, the punch press has become an important addition to the shops of the larger railway companies, and has proved its worth in every case where sufficient work to operate it a majority of the time is available. The wide variety of uses for this type of machine and its economical operation have been important factors in its adoption by the railway industry.

The Southern Pacific Railway, at its Sacramento shops, has two punch presses in operation, making a variety of small parts, some of which are illustrated in Fig. 1. The company has approximately 600 dies in use, and has evolved a system of standards for die construction and maintenance. Although some of the dies are used only intermittently, the company has found that the saving resulting from their use has more than equalized the cost of storage and maintenance. Some of the dies are standardized in order that parts may be replaced without interfering with production, while others which are used less often are specially designed.

Close co-ordination between the design department and the manufacturing department has resulted in the redesign of a number of sheet-metal parts for press manufacture and also of certain dies so that die parts may be made quickly interchangeable.

Most of the parts are for car-shop work, although there are a great many parts constructed for locomotive maintenance. These include clear-water gages, engine lamps, engine-oil cans, water-cooler cupboards, headlight parts, jacket lugs for steam and electric lines, feedwater strainers, washout-plug pockets, washers, eccentric strap liners, and shims for cross-head guides.

A die set-up in a press for blanking out the bodies of journal-box cooler covers is illustrated in Fig. 5. The material is 26-gage sheet steel. The die is made in sec-

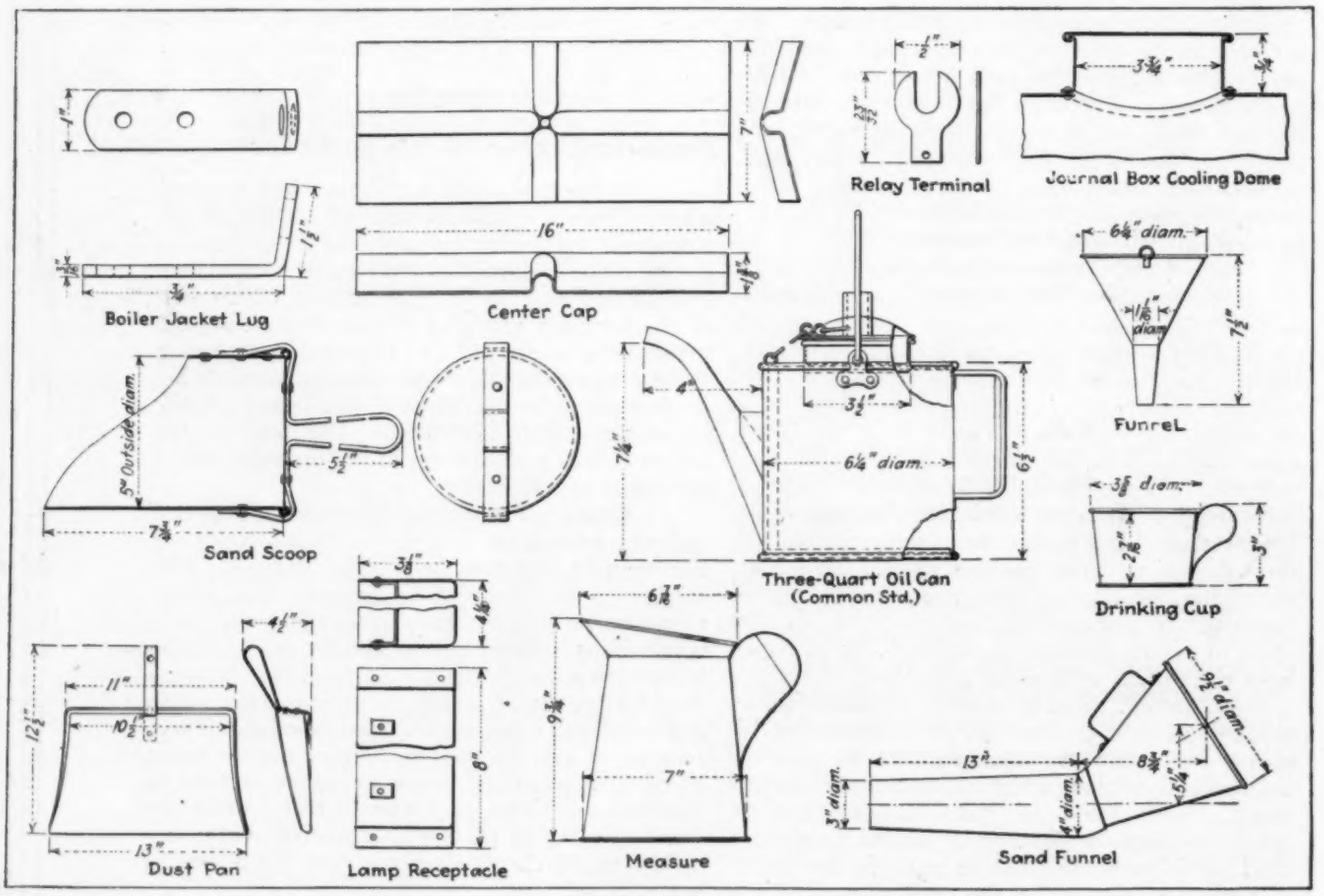


Fig. 1—Some of the sheet-metal parts for railroad cars and locomotives which are now made on the punch press by means of such operations as blanking, dieing, and forming

tions, and has back and side stops for gaging the strip. Pressure pads operated by rubber cushions eject the work when the ram recedes. Other dies, shown in Figs. 2, 3, and 4, represent typical blanking and forming dies of the type used in this plant. Although none of them are radically new in design, they are representative of the type of dies used in this class of work.

The sheet metal which is punched and formed varies from 10- to 16-gage (0.015 to 0.62 in., for most parts, with the exception of pieces such as jacket lugs, which are made of band iron.

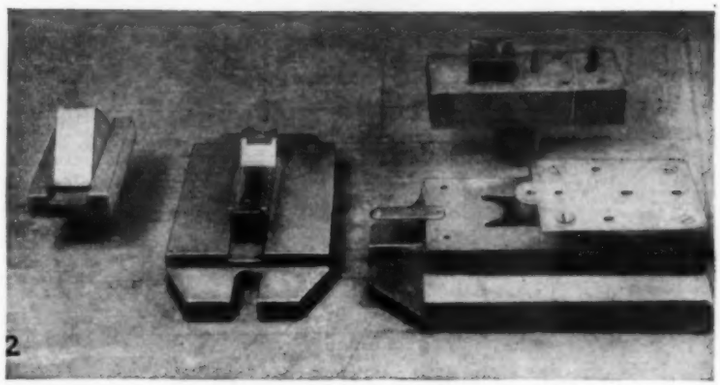


Fig. 2—Two dies used in connection with the construction of boiler-jacket lugs. At the right is a progressive-type blanking die equipped with two wire punches and a larger form punch that trim the ends of the blank. The die at the left shapes the blanks to an angle

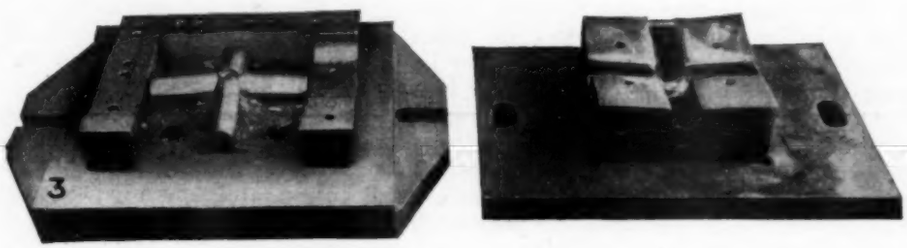


Fig. 3—A forming die for shaping center caps for Murphy roofs. The stock is received as a blank. It is gaged in the die against two faces. The punch, shown at the right, forms the cross-ribs to shape

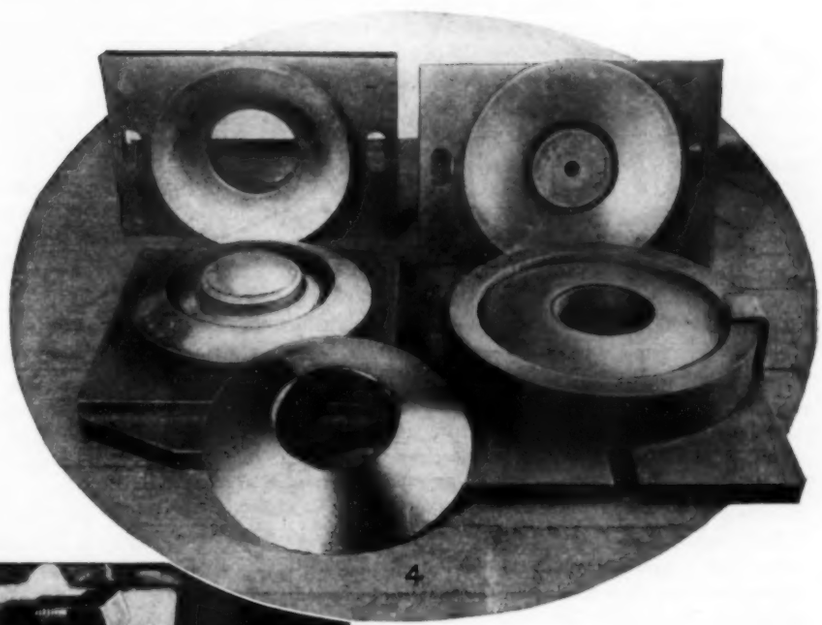


Fig. 4—Two dies used for making targets for searchlights, of 18-gage sheet steel. The die at the right blanks and draws the target to shape, while the one at the left is used to redraw the center opening

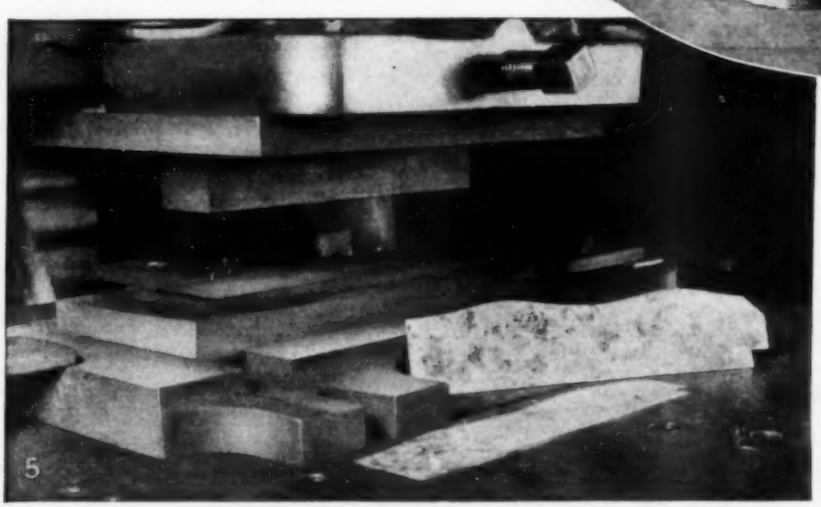


Fig. 5—An example of a sectional blanking-die set-up. The die has two finger stops for locating the work, and is equipped with rubber-cushioned ejecting pads. None of the above dies are unusual in any respect, but they are typical of the increasing applications of the punch press in railway work

WORLD CONGRESS ABSTRACTS

Hydraulic Feeds and Speeds

By A. L. DeLeeuw

BY ITS very nature, the hydraulic feed permits of almost unlimited pressures. This feature was recognized almost 40 years ago when large ingot-boring lathes were constructed by the Niles Tool Works Company. In these lathes the boring bar was fed into the work by hydraulic pressure. Other examples of early hydraulic feeds might be included. However, all these feeds were more or less of special interest and had not the same general application as the present-day hydraulic feed.

Expressed in general terms, a hydraulic feed mechanism consists of a pump, a motor, a transmission, and controlling devices. In many cases two pumps are used, one for high pressures and small displacement, the other for low pressures and large displacement. As a rule, though not always, the high-pressure pump is of the adjustable-displacement type—that is, it can be set for a greater or smaller amount of liquid pumped per unit of time.

Pumps of the adjustable displacement type are made in various ways. In one type a number of pump cylinders are placed radially in relation to the driving shaft. In another, the cylinders are placed parallel with the driving part, and in still another, in which the cylinders are also parallel with the driving shaft, two sets of cylinders are used, the stroke of one being adjustable to give a differential effect.

The motors used for hydraulic feed are almost exclusively hydraulic cylinders, but there is no reason why some other type of motor may not be used where conditions call for it.

The transmission devices used for hydraulic feed are merely arrangements of pipes and valves. The controlling devices cover the entire range of mechanical controls as well as hydraulic controls.

The foregoing devices are described with the assumption that the pump is an adjustable-displacement pump. There are, however, a great many installations where constant-displacement pumps are used to good advantage. Though it is not exactly correct to say that the table movements of grinding machines are feed movements, yet it is sufficiently correct to include such movements among the hydraulic feeds. These movements do not require the fine adjustments which are necessary for feeds. As a consequence, the pump used for the movement of grinder tables is usually a gear pump of high quality. Such pumps are made by the Heald Company, Pratt & Whitney Company, and others. Pumps of this nature can be made to produce very high pressures. With such a pump it is possible to displace a large quantity of oil under moderate pressures and this, as will be seen later, is desirable for a number of functions. Such pumps can be used not only for quick traverse purposes, of which the table movement of a grinder may be said to be one, but they are also useful for feeds such for instance, as for drill presses.

In the adjustable-displacement pump the amount of power driving the pump is limited to a definite maximum, and, consequently, if the stroke of the pistons is reduced and the amount of oil displaced is therefore limited, the available pressure becomes greater.

Outside of the unavoidable mechanical losses by friction and similar causes, there need be no further losses in the adjustable-displacement pump, whereas in the gear pump all the power is lost, except that which is actually used in the machine tool. On the other hand, attention must be called to the fact that if all of the power of an adjustable displacement pump were used with very short stroke of the pistons, then the pressure would mount beyond practical limits, so that even here a relief valve becomes necessary.

Theoretieal advantages of the hydraulic feed are:

1. The amount of feed can be varied by infinitesimal steps between the maximum and minimum required by the machine.

2. The feed is not subject to the irregularities caused by the action of gear teeth or by the spring of shafts in an ordinary mechanical feeding device, and as a result, the machine produces a smoother finish.

3. The device can be, for the greater part, outside of the machine, so that in its very nature it can be applied as a unit to any machine, whatever its kind or style, though, of course, for economical reasons, different sizes of pumps would be used for various sizes of machines.

4. It is claimed that the same size of machine is capable of heavier cuts when using hydraulic feed than when using a mechanical feed.

5. The losses in feed power are said to be less with the hydraulic feed than with mechanical arrangements. It should be realized that this statement is rather broad and depends entirely on the construction of each of the two devices used. However, considering the fact that in most mechanical devices there are long trains of gears and shafts between the points where the feed is taken off and where it is applied, it is very likely that the above statement is correct in most cases.

The disadvantages of the hydraulic feed are:

1. It is not possible to utilize the hydraulic feed where a definite amount of feed per revolution of the spindle, or in general, per cycle, is required. It is, for instance, not available for screw cutting.

2. The unavoidable leakage of the oil past the piston causes a reduction in the theoretical amount of feed. This would be no disadvantage if this reduction would always be the same percentage of the total feed, but this is not so. In addition, it should be considered that, as a rule, the pressures are low when the maximum amount is supplied and high with the minimum, so that the tendency to leak is greater at the low feeds than with the high ones. This change in the amount of leakage when changing from high pressures to low, or vice versa, causes an uneven feed when the amount of cut varies considerably. This would cause an uneven finish.

All of the above irregularities are exaggerated when air is present in the oil, and it therefore becomes necessary to eliminate all of the air before the oil is put into the system. In a closed system, very little oil needs to be added from time to time and it is an easy matter to keep this added oil free from air. In an open system there is a rise and fall of the oil in the reservoir, and this causes a certain amount of air to be taken up by the oil.

In some machine tools it is desirable that the feed shall move with perfect evenness, such, for instance, as in screw cutting. In other machines it is of very little importance whether this movement shall be perfectly even or not, as, for instance, in drilling. Although, in this latter case, reasonable evenness of motion is desirable, a variation of a few per cent will not cause any trouble.

In some machines it is not of much importance whether the feed movement stops at a certain definite point, or a few thousandths of an inch before or after; such as in the case of drilling, boring, or milling. But in other machines the ability to control the end position of the feed may be of the highest importance; such, for instance, as in machines where shoulder work is done or where accurate facing must be accomplished. The hydraulic feed does not lend itself to such accuracy of control unless special devices are employed outside of the pump and cylinder.

Two of the papers presented by American engineers at the World Engineering Congress being held during October and November at Tokyo, Japan, are abstracted in this issue of *American Machinist*. Another paper will be presented next week in the Product Engineering issue, on "Present Practice and Trends in Truck Design."

Where several machine elements have to work together, hydraulic feeds may be used, provided that the various elements are mechanically connected. It would seem at a first glance that it is not possible to feed the various elements each by its own cylinder and keep them in the proper time relation one to the other. However, unless a very accurate relation of the various elements is required, it is perfectly feasible to have several elements each with its own feed motion, each controlled by its own cylinder, and yet all deriving their power from one common pump.

Where such elements of a machine tool must be in positive relation to each other, the above arrangement is no longer applicable. Such is the case, for instance, in screw machines where there is a turret slide and one or more cross slides. Unless these elements are timed together in some positive manner, there is possibility of tools interfering with each other, or tools not having been withdrawn when indexing takes place, or many other possibilities which may suggest themselves to those who are familiar with the functioning of automatic machines in general. In fact, this limit does not confine itself to screw machines, but applies to all automatic machines where there is more than one element to be fed in or to be moved in some way relative to other elements.

That hydraulic feeds are constructed now have certain limitations does not mean at all that these limits cannot be extended or that difficulties that present themselves now cannot be overcome. The writer wishes to point out some lines along which such extension may take place and, perhaps, has taken place. In order to broaden the application of a system, it is necessary that one should first realize the advantages to be derived, then see the difficulties to be overcome, and finally find the means either to avoid or surmount these difficulties.

One of the greatest advantages of the hydraulic or pneumatic feed is the fact that the amount of pressure which can be applied is limited. A certain device may be set for a pressure of 1,000 lb. or 100,000 lb., but once set for that pressure, no greater pressure can be developed. On the other hand, with a mechanical device, the pressure which can be exerted is unlimited. A small amount of power applied to a feeding device can be destructive if the feed is slow enough. This is not the case with a hydraulic feed. If the relief valve is set to, say, 600 lb. per sq.in. no greater pressure can be exerted in the cylinder which moves the machine elements. This makes it possible to feed against a stop with absolute certainty that nothing can break as a result. If, for instance, in a cam-fed machine, a stop had been placed in the path of the moving element, something would break if the stop were not placed with perfect accuracy. No breakage can result in that case when hydraulic feed is employed.

Control mechanisms of any kind, whether mechanical or hydraulic, are operated by the movements of the element which is being fed, or by some part moving in synchronism with it, such as a dog disk. Making use of the fact that the hydraulic feed can move a machine element against a stop without the danger of causing breakage also means that this machine element has come to an absolute standstill during a certain amount of time, however small this amount may be. As a result, the machine element cannot control the feed mechanism during the last part of the cycle and therefore the entire feed must come to a standstill because the cycle is not being repeated. There are various means by which this difficulty can be overcome without loss of the advantages of having the machine element come to a positive stop and rest there during a certain period of time. One such means might be to have the feeding element, such as a turret slide of a screw machine, rest on a secondary slide with a loaded spring between the two. This spring may be loaded to a pressure exceeding the maximum pressure required for the feed but less than that which can be exerted by the hydraulic cylinder, so that the spring does not come into action during the period of feed until the turret slide comes up against the positive stop. The cylinder then moves the auxiliary slide a sufficient distance to operate the control.

Another means of obtaining the same result would

be a mechanical-hydraulic arrangement. The machine element to be fed has a nut operating on a screw of which the thread is of such a steepness that the nut causes the screw to turn. A light, mechanical feed mechanism operates the screw by means of a roller clutch. The thread of the screw is of less thickness than the width between threads in the nut, and the speed of the movement, as provided by the screw, is somewhat less than that given by the cylinder, so that when the cylinder moves the machine element forward, the screw is dragged along and ahead of the movement which it would derive from the mechanical feeding device. When the machine element has come to a positive stop the mechanical device will take hold of the roller clutch and began to drive the screw.

During the time that looseness exists in the nut, that is, before the thread of the screw comes in contact with the thread of the nut, the control can take place. This control will cause the hydraulic cylinder to move the machine element backward, and in doing so the screw is turned by the nut in the opposite direction from that which the mechanical feed mechanism would give it. A double control is necessary for this reversal. This does not lead to great difficulties, for it is possible to reverse the mechanism a little ahead of the reversal of the oil, owing to the looseness of the screw and the action of the roller clutch.

The two means mentioned are given merely as examples of possibilties; many other means and ways to accomplish the same results will suggest themselves to the engineer confronted with some definite problem of this kind.

It may be said that one of the advantages of the hydraulic feed is that a machine element can be brought to a very accurate position of stoppage, but with the accompanying disadvantage that then this machine element is no longer capable of controlling its future movements.

To say that this is one of the disadvantages of the hydraulic feed is, perhaps, using the wrong term. It would be more accurate to say that the quality of the hydraulic feed permitting a machine element to come to a definite stop requires also some assistance from mechanical means. When properly constructed, the hydraulic feed permits quite accurate reversal, which would make it a suitable means for a shaper drive. The use in such a drive of the loaded spring mentioned would allow a construction which permits the shaper ram to come to a positive stop and thus enable it to cut up to a shoulder or to a line.

It is possible to actuate a number of cylinders on one pump with a sufficient degree of accuracy to make such an arrangement suitable to two- or three-way, multiple-spindle drilling machines. However, such an arrangement is not of sufficient accuracy to permit its use in automatic machines where a number of varying elements have to work in time with each other. In such machines, elements may be required to be in certain definite relative positions with regard to each other at any time during their operation, not merely at the end of a stroke. Such accuracy cannot be obtained by the use of the hydraulic feed alone. However, it is possible to aid the hydraulic feed by mechanical means in such a way that perfect timing is reached. Such arrangements may not be practical in all cases of automatic machines, but may be of considerable usefulness in others. For instance, they would make it possible to construct automatic machines in which the moving elements have long strokes without the use of excessively large cams.

Various arrangements will suggest themselves to the engineer confronted with the design of automatic machines. The hydraulic feed lends itself peculiarly to combination with mechanical arrangements in which the hydraulic part plays the rôle of power drive while the mechanical part plays the rôle of controlling device. That such devices have not yet appeared to any large extent is probably because of the newness of the application of the hydraulic feed.

Not much can be said regarding the present status of hydraulic drive. In a way, the movement of grinder tables and similar elements may be considered as a hydraulic drive, or as a hydraulic feed. What is considered "the drive" when speaking of machine tools, namely, the rotation of the spindle or the movement of that part of a machine tool which causes a cut to take place, (such as a planer table or a slotter ram) has not yet appeared to any extent.

The Waterbury Tool Company has applied a pump as a motor to some lathes, and there may be other isolated cases where this kind of hydraulic drive has been applied, but nothing has as yet been developed which has attracted the attention of the users of machine tools.

These machines, which are on the border line of the field of machine tools, have appeared: broaching machines having a hydraulic drive, and also certain power presses depending on the adjustable-displacement pump for their power. Both classes of machines seem to be quite successful. The broaching machine depends for its forward or cutting stroke on the variable pump, and for its return stroke on the low-pressure, constant-displacement pump. The hydraulic press depends for its approach and return on the constant-displacement part of the pump, and for its actual working stroke on the variable-displacement pump. With the exception that the actual working stroke can be accomplished at various rates of speed, these hydraulic presses do not differ in any essential point from presses in existence for many years in which the idle part of the stroke was produced by low pressure and the working part by high pressure.

The Fourth Product Engineering Number

Next week we shall publish the fourth Product Engineering Number of *American Machinist*. In it will be articles on centralized lubricating systems for machinery, spring design, the photo-electric cell in industry, Cadillac's new engineering building, the design of aluminum screens, textolite gears, and an abstract of a paper on motor truck design. Comments on the issue will be welcomed with pleasure by the editors.

Trends in Standardized Quality Production

By JOHN H. VAN DEVENTER

MASS-PRODUCTION has just begun to demonstrate what it is capable of doing. What it has shown in results is convincing evidence that the mastery of its principles; their correlation with organization, finance, and distribution; their synchronization with demand and consumption; and their extension to industries and countries that are not sharing in their benefits, constitute the largest industrial problem of the coming decade.

In the solution of this problem, the engineer must play an important part, for mass-production, while it overlaps and enters the areas of organization, finance, and distribution, is nevertheless based upon a production engineering foundation. It emphasizes quantity and omits quality. This is unfortunate, because quantity output, as we know it, is merely the effect of standardized quality. Without the attainment of a standardized quality, quantity production would be impossible on an economic basis. From this standpoint, the term "Standardized Quality Production" seems preferable as being more definitive. In its broadest sense, standardized quality production applies to the making of simple products, such as matches, bricks, flour, paints, or bread, just as much as to the more complicated products.

With the more complicated product, automatization, even if possible, would not be practical, for the evolution of consumer demand establishes progressive standards of style, utility, and design which the successful manufacturer must anticipate or must lose his market. He must, therefore, maintain a certain flexibility in the process of manufacture. The endeavor to secure a more or less complete automatization in a multi-component product would be detrimental to design flexibility. Therefore, in the more complicated products, production engineering must substitute co-ordination, process simplification, and integration for automatization on a large scale.

The principle of interchangeability involved, of course, the prior standardization of the product parts. It also involved the elimination, so far as possible, of "hand work" as too tedious and expensive a means of attaining the required interchangeability. Thus it inspired the development of what we know as "jig and fixture" methods for eliminating dependence on human skill in attaining accuracy and duplication. Concomitantly, it inspired the development of adequate means of determining and checking the accuracy of parts produced, and thus gave rise to our modern methods of gaging and the use of the limit system in manufacture.

Interchangeable manufacture or quality control has been instrumental in developing most of the phases of production control embodied in modern production engineering. Inventory and material control, turnover of men, materials and capital, nature of machine arrangement, methods of cost accounting, labor relations, compensation, foremanship and supervision, indeed the very framework of industrial organizaiton and management, have been altered, amended, and improved by the demands of standardized quality production.

Integrated manufacture, through mechanical handling, has reached its greatest present-day development in the automotive industry. The first installation of mechanical handling apparatus for production purposes in this industry was made in the Ford plant at Detroit, Michigan. Integrated production did not originate in the automotive industry. The cement industry was the first to incorporate handling as a vital factor in a continuous process. The meat packing industry followed, together with the saw mill industry. The application in the cement industry began about 1890.

The application of mechanical handling to production was first impelled from the obvious motive of substituting power for hand labor in the matter of transportation. In other words, it was a direct labor-saving motive. An electric hoist or other piece of apparatus, for example, would enable the release of a certain number of laborers and effect a certain direct-labor cost saving. While this saving is always present when properly chosen equipment is applied for handling, it has become a minor consideration on the part of management in connection with standardized quality production, in view of other economic benefits which accrue through proper mechanical handling.

Under integrated manufacture, in the mechanical industries, mechanical handling may be divided into two principal heads:

1. Bulk handling of raw materials previous to processing, and the final handling or disposal of the finished product.

2. Intra-process handling. This may be broken down into (a) Inter-operation handling of unit parts through sequential operations in compacted production chains, (b) inter-department or inter-group handling, (c) co-ordinative production handling, in which successive hand operations are knit mechanically into a co-ordinated sequence.

Through the co-ordination of these production activities by means of the proper application of handling equipment, the entire process, from raw material to finished product is knit together in a carefully timed and balanced flow. The plant thus becomes not a matter of individual departments and operations, but a complete production mechanism the units of which are knit together and synchronized by mechanical transportation, and in which work proceeds at a predetermined production rate and with a minimum of elapsed time. This is the ideal condition of integrated manufacture.

Aside from the saving effected by the substitution of machinery for hand labor in transportation, the following economies are effected by mechanical handling in standardized quality production:

1. Floor space required for a given production rate is

reduced to a minimum by close spacing of the machines.

2. Idle time of machines and operators is reduced to a minimum because there is no waiting for product parts at any operation.

3. Idle time resulting from machines being out of repair is reduced to a minimum because this system forces the installation of preventative maintenance and means of quick replacement.

4. Because of the steady flow of work, and the balancing of operations, there is practically no accumulation of stock in process.

5. An automatic "pacemaking" effect is produced, which minimizes the amount of supervision and time-keeping required.

6. Weak spots in men, machines, or processes become obvious at once and can be corrected quickly.

7. Physical effort on the part of workers is conserved, since there is practically no lifting or carrying.

8. The over-all time of the process from raw materials to finished product is reduced to a minimum.

Machines Grouped According to Sequence

Under integrated manufacture, productive machines are grouped, not according to kind, but with regard to their sequence in the process. Thus we do not have "departments" such as were in vogue a few years ago, where planing, stamping, milling, drilling, and other operations were segregated; on the contrary, we have chains of operations and production machines so arranged that raw material goes in at one end and a finished product comes out of the other. This development itself has been responsible for tremendous production economies.

Another result of integrated manufacture has been the splitting up of operations into their primary elements. Thus an operation which formerly was completed by one man on one machine is found to be divided into a number of successive steps, performed by several men on several machines, in parallel or sequence. This is a necessity from the standpoint of balance in integrated production.

This simplification or splitting up of operations, primarily necessary to secure balance and continuity, has had two most important results. The first of these has been the enlargement of the labor market. With the simple elemental operations now prevailing in standardized quality production processes, specialized skill and long periods of training are no longer required for productive labor. The second has been the radical alteration of the production engineer's method of appraising production efficiency. The manufacturing cycle becomes the center of thoughts as distinguished from the individual operation, transportation between operations becomes the backbone of the process, or co-ordinator of effort, and over-all efficiency becomes the objective, as distinguished from individual operation efficiency.

Even a brief review of developments cannot afford to omit some reference to the changes that are today taking place in standardized quality production philosophy.

The old school of thought held that long-term standardization of product, with the resulting economies that came from it through the avoidance of interruption owing to design changes, produced the ideal economic conditions. This philosophy has its base on the product.

The new school of thought turns to the consumer for its base instead of to the product. It holds that in the final analysis it is the consumer, rather than the product, which determines the possibilities and limitations of standardized quality production in any given field.

The trend towards this new school of production philosophy was accelerated by the need of regularization indicated by growing symptoms of overcapacity in certain lines. This has caused the development of practical exploration of consumer demand from the quantitative standpoint for the purpose of fixing production programs in accordance with reasonable expectations, thus securing a degree of regularization. However, from this practice, which has been in use in progressive industries for the past four or five years, there has come a *qualitative* exploration which is considered to be equally as important as the quantitative. The purpose of this has been to determine and thus anticipate style and design trends in consumer demand.

That drastic changes in product design, particularly in the case of such a complex mechanism as an automobile, involves a tremendous secondary effect on jigs, fixture, tools, equipment, and even methods, is apparent to any engineer. That such a changeover can be effected without a serious hiatus in production was recently demonstrated by the Chevrolet Motor Car Co. in changing from a four- to a six-cylinder model. This was, substantially a complete redesign, affecting 82 per cent of the components of the car. In other words, of the 1600 components of the four-cylinder model only 287 are interchangeable with parts of the new six-cylinder model. A corresponding changeover of jigs, fixtures, and tools was, of course, involved, the cost of the entire changeover being approximately thirty million dollars.

Automobile Production in Two Divisions

In presenting a description of the changeover, it must be kept in mind that this company divides the production of automobiles into two divisions. One of these is parts machining and motor assembly; the other is car assembly. The assembly is performed in different plants in different localities; the machining and motor assembly being centralized at Flint, Michigan.

It had been determined some years ago that a production rate represented by a consumer demand of one million cars per year or more would make it economically possible from the cost standpoint to change from a four- to a six-cylinder design. In anticipation of the attainment of this quota, designs had been prepared, and experimental motors built and tested. However, it was not until May 15, 1928, some two years after demand had established a quota in excess of a million cars per year, that the final design was submitted to the Executive Committee of the General Motors Corporation and was approved. This date estabished the beginning of the changeover from the production standpoint.

In a changeover of this sort it is obvious that there must be, even under ideal conditions, some hiatus between the cessation of production on the old design and the beginning of production on the new, in order to enable manufactured parts of the old model to be assembled into complete cars and the dealers to dispose of cars on hand. In the case of the Chevrolet changeover, which involved 82 per cent of a complete re-design, the elapsed time between full production rate on the old model and an equivalent production rate on the new model, was 120 days. However, because of production of the new model on a gradually increasing scale during three months of this interim, the net actual production hiatus was reduced to the equivalent of but 62 days production.

In order to prepare for production of the new model without interfering with the old, a development opera-

tion was set up at another plant, removed from existing production activities. This consisted of a tool room, tool designing department, and a collection of one machine of each kind required for machining the various parts of the new model.

Here, for six weeks, the engineers, production officials, foremen, and heads of related departments (such as foundry, forging plant, and stamping plant) met to discuss each part and the relation of its design to production problems. Designs having been harmonized with production, the next step was to produce and test a set of tools and fixtures. While this was being done, a complete machining "line" was assembled.

As soon as a tool or fixture was found satisfactory, it was sent to the main tool department at Flint, Mich., where the number required for the full production quota of 30,000 units per week was made. In the meantime, orders were placed for the machinery required to complete the three production lines. As soon as 1,000 sets of parts had been produced at Saginaw on the first machine line, assembly was begun in a small way.

This preliminary work was done without interrupting production of the old model, which continued, at Flint, until Sept. 30, 1928. The work at Flint was put in charge of assistant foremen, the foremen being taken to Saginaw to familiarize themselves with the new production.

On Oct. 1, the Flint plant was closed, the machinery removed, and that portion required for replacement parts of the old model set up in a separate building. After this the work of re-equipping the Flint plant for the new production began. To this end, the first production line was moved from the development plant at Saginaw to the Flint plant and steps were taken to complete at Flint the two additional lines required for the full quota. The final line was in place by Jan. 15, 1929.

The foregoing is a brief example in the evolution of standardized quality production and its influence on concomitant branches of production management. It is now in order to consider, from the engineer-economist's viewpoint, some of the effects that are being produced by the enlargement of the trend, and by its influence upon related phases of industry and business.

Production Creates Consuming Power

The automobile industry, partly through an intelligent understanding of economic principles and partly through the driving force of competition, has put into effect, through its pricing policies, a principle made possible only by standardized quality production, and without the application of which it can never exert its fullest possible wealth and prosperity creating force. It now recognizes and acts upon the economic fact that the increments of consumer buying power come from the decrements of price for a given unit of value of product, which is an expansion of the now familiar aphorism that production creates consuming power.

It must not be inferred that the automotive industry is the sole beneficiary of these economic principles. It does represent the most intensive and successful present-day application of those principles, but they have been and are rapidly being applied to other industries of all sorts.

Standardized quality production and its concomitant of mass distribution are already about consolidations of capital at a rapid rate and on a hitherto unheard of scale. An indication of this trend toward the consolidation of facilities was apparent in the United States four years ago, according to the industrial statistics of the U. S. Department of Commerce. From 1914 to 1925, the portion of the total output of the United States produced by firms doing an annual business of one million dollars or over, increased from 48.8 per cent to 67.6 per cent; which the portion of the total produced by firms having less than one million dollars annual output decreased from 51.4 per cent to 32.4 per cent. While a portion of this increase is due to re-classification of firms caused by the decrease of dollar buying power, it nevertheless indicates a significant trend even at that date (1925). The trend has been even more apparent in the United States during the past two years, but figures to express it definitely are not available.

Production Development Forces Remodeling

Managerial activities and relations between capital, labor, and management are being remodeled to cope with this development. Production engineering, under these developments, takes on a broader aspect, and production engineers must grow in proportion to the growth of their responsibilities, not merely in a better understanding of the technical details of their particular work, but in an understanding of the movement itself and of the economic laws that are actuating it, if they are to maintain leadership.

Standardized quality production is bringing new responsibilities and new problems to management, which will press for solution during the next few years. One of these is the problem of overcapacity, and entailed in this is a certain degree of temporary unemployment resulting from increased efficiency. Except in industries which have markets that are expanding more rapidly than the normal expansion of population, this is the tendency of standardized quality production. It is obvious that more output per worker means less workers for a given output or per unit of consumer population served by that product.

This is an economically sound and beneficial result characterizing efficiency gains in an industry which has reached comparative stabilization. Under proper conditions, the surplus of wealth represented by profits, dividends, and wages provides the capital for the further diversification of industry, for reabsorbtion of the displaced labor in new industries, and for improvement in the general standard of living.

In order to take advantage of this beneficial economic increasing spiral (as distinguished from economic circle) engineers must provide industry, through invention and organized experiment, with an increasing flow of new products.

Some economists have expressed the fear of a general overproduction, providing in the present rate of progress acceleration indicated by the spread of standardized quality production is maintained. I do not hold this opinion, nor do I think that the growth of efficiency in one industry or one country can permanently depress the prosperity of neighbor industries or neighbor countries. It will be time to talk about general overproduction when every man and woman in the world, who is willing to work, has the opportunity to earn and enjoy an adequate and comfortable measure of prosperity. In the meantime, we should remember and act upon the related truths that wealth is the antidote for poverty; that efficiency gains in production are the fundamental causes of increased wealth, and that standardized quality production has demonstrated its outstanding ability to build production efficiently.

Diesel Engine Set-ups

THESE VIEWS show stages in the manufacture of two- to eight-cylinder Diesel engines capable of producing 20 to 500 horsepower. The engines are used for marine work, generating purposes, and for the operation of cotton gins and similar

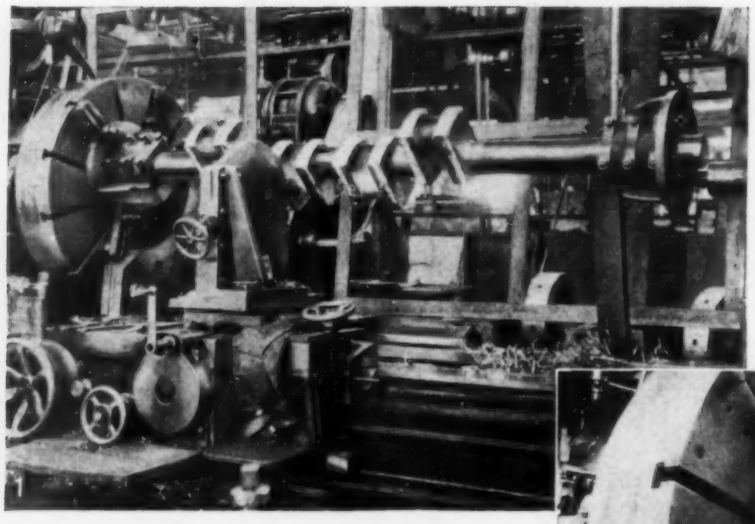


Fig. 1—Turning the throws, or pin bearings, of a crankshaft in an engine lathe equipped with a fixture and centering head. When the main bearings are to be machined, the shaft is supported between centers, but while the throws are being machined, the centering head supports the outer end

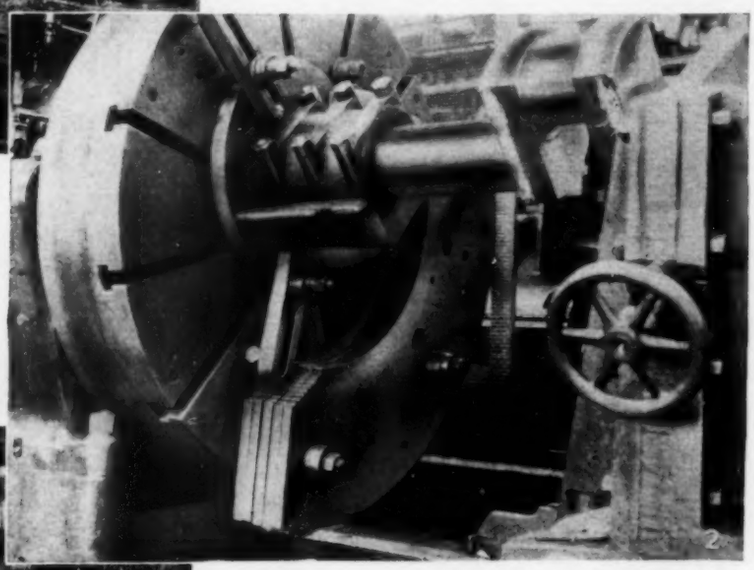


Fig. 2—Close-up view of the fixture for holding crankshafts while the throws are being turned. The fixture holds the work by clamping against the turned diameter. Counterweights made up of a series of plates are attached to the faceplate to balance the work

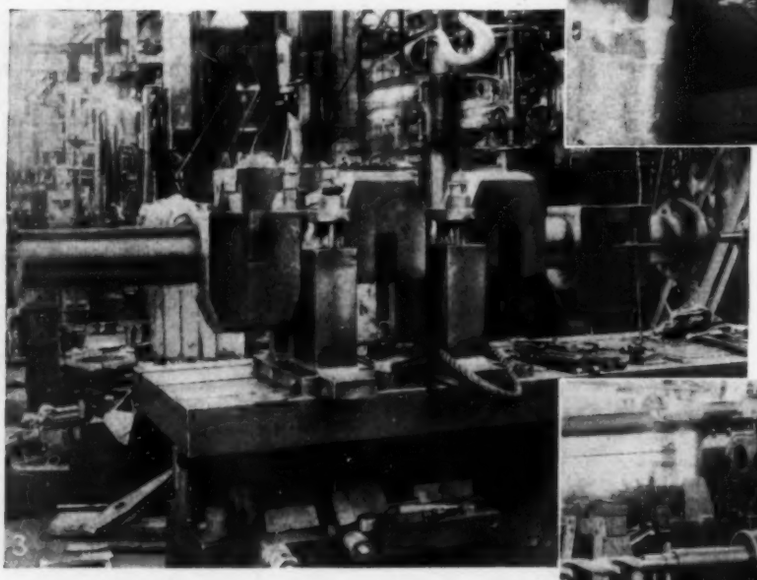


Fig. 3—Close-up of the set-up used for drilling and tapping flange holes in an engine crankshaft. The work is loaded in a horizontal drilling machine by means of an overhead air-hoist, and is supported by two V-blocks under the rough-turned main bearings. Strap clamps held by studs located in the V-blocks hold the work during the operation. A surface gage is used to align the work

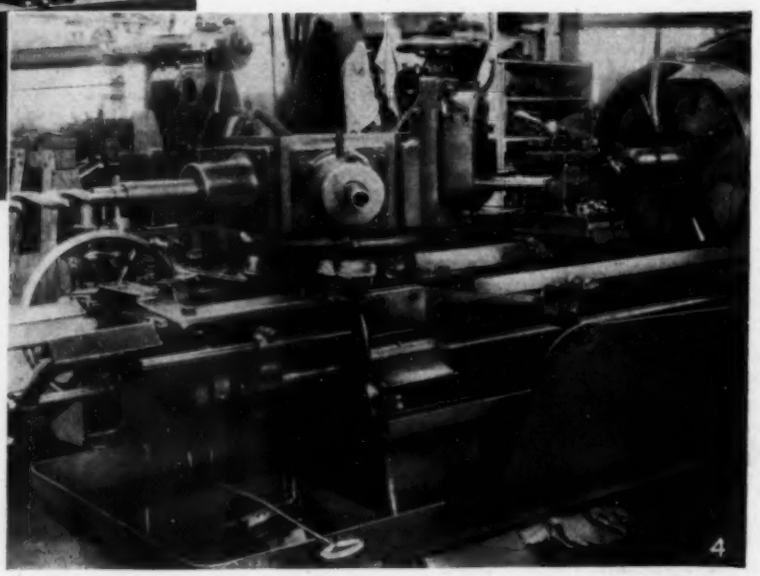


Fig. 4—Turning a wristpin for a Diesel engine. Connecting-rod bearings, gear blanks, and similar pieces not exceeding 5 in. in diameter, are also finished in this type of turret lathe

in a West Coast Plant

Photographs by courtesy of the Atlas Imperial Diesel Engine Company

machinery. Continued improvements, resulting in decrease of the weight per horsepower and increase of the fuel economy of this type of engine have made it available for use in automotive and aeronautic installations with a considerable degree of success in each.

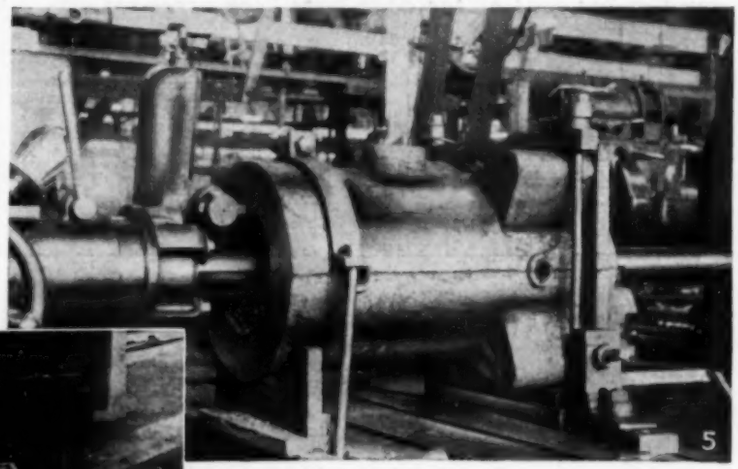


Fig. 5—A cylinder for a 200-hp. engine set-up on a horizontal boring mill for machining. All boring, reaming, and facing of the bottom surface are done in this set-up. At the left may be seen the star-feed facing head attached to the spindle of the machine. The work is supported by a V-block and a U-support, and is held in place by strap clamps. The bore is finished by grinding

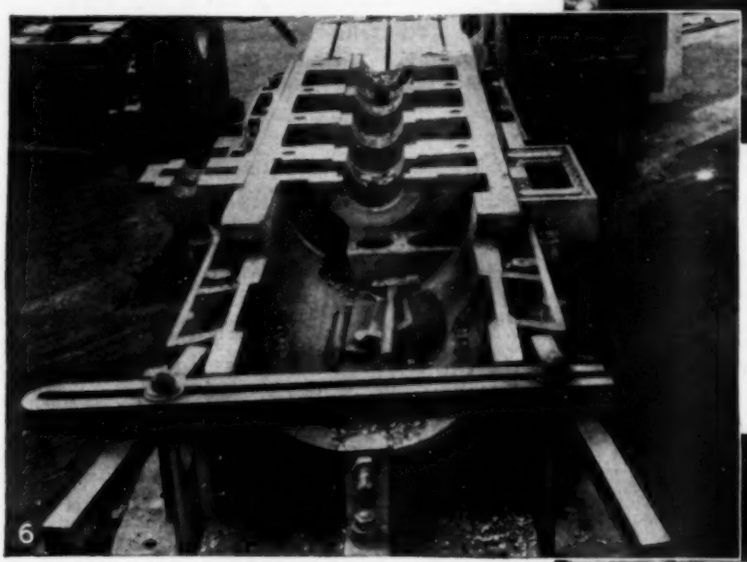


Fig. 6—Planing the top face of the crankcase for a 50-hp. marine engine. The operation includes rough- and finish-machining the pads on both sides for the circulating pump and fuel pump. After this operation has been completed, the crankcase is fitted with bearing caps and is then ready for boring

Fig. 7—Set-up for boring the crankshaft bearings of a crankcase. The work is set up on parallel bars and is held by strap clamps, as shown at the lower right. The roughing cut is done by a single tool, whereas the finishing cut is done by a multiple-tool boring bar so that all bearing holes are finished at once

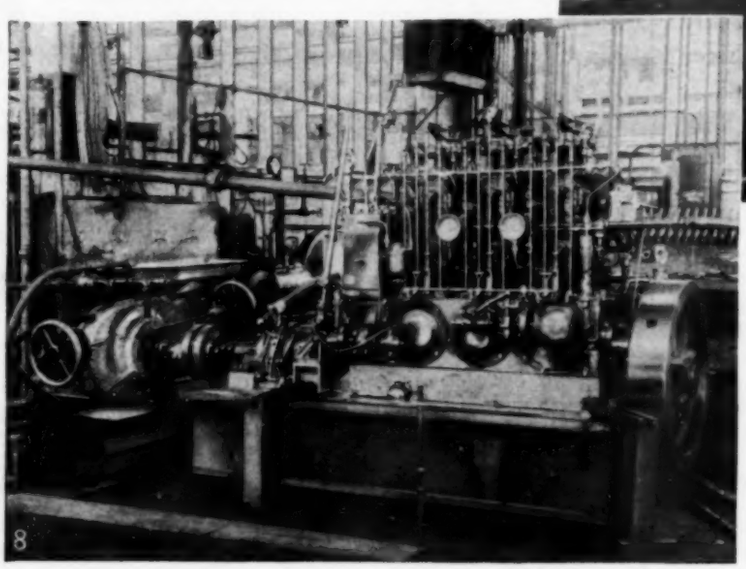


Fig. 8—Testing a 30-hp. Diesel marine engine. The engine is run under load for 20 to 30 hours. At the left is shown the water-brake testing equipment which subjects the engine to normal operating load

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions given at the foot of the page have been arranged

Compulsory Membership in the Mutual Aid

"MORNING, Al, why so downhearted?" Ed hailed, as the two foremen met on their way to work. "Something go wrong with your breakfast?"

"No, I had a good breakfast, but my wife and I were discussing Joe Fisher and his troubles."

"What's the matter with Joe, did he get hurt?"

"No. He's down with pneumonia and won't be back to work for several weeks."

"How's he fixed financially?"

"Not a dollar, except his back pay. His wife says Joe never could save money."

"Oh, so you've been doing the good Samaritan act again, have you?"

"Call it anything you like, but when one of my men is in a bad way it's my business to help him."

"Sure, but why should *you* worry? The mutual aid will look out for him."

"I wish you were right, Ed, but Joe never joined. He said he couldn't see paying dues when he wasn't sure he would ever get any return; and now his family has to suffer for it."

"It's queer, isn't it, Al, that the man who doesn't believe in insurance, never takes any other precautions to protect his family."

"It sure is, but it's true."

"Why don't we do as they do at the plow works? When a man applies for a job over there, he is asked if he is willing to join the mutual aid. If he says, 'no,' he isn't hired, and that's that."

"That's all right, Ed. Personally, I would like to see Williams make joining our mutual aid compulsory; I've talked with him about it several times."

"What does he think about it?"

"I think he feels the way we do, but the 'big boss' is afraid that some of the men might feel the management was interfering with their personal privileges."

"Maybe some of the 'shop lawyers' might, but they don't have to work here, do they?"

"You're right in a way, Ed. Of course all rules and laws interfere with some of our so-called 'rights,' if you want to put it that way, but we all agree that compulsory rules are necessary for the welfare of people who lack either the ability or inclination to look out for themselves and their families. Joe Fisher is a good example; if he had been compelled to join the mutual aid he would never have missed the little he paid for dues, and his family would not be in the fix that they are."

"Why don't you talk to Williams about it? It will save money for you, Al."

"Think I will. And in the meantime, if you see any of Joe's friends, tell them to drop in and see him."

How far can management go in protecting employees against their own improvidence? Is compulsory membership in relief societies justified? If the majority are willing to join, should that bind all?

Idea suggested by William J. Owens, Foreman, Newport Rolling Mills Company

All foremen are urged to discuss these questions vital to their work; of course the

DISCUSSION OF EARLIER TOPICS

Should Workers Buy Company Stock?

IMPARTIALITY and the careful avoidance of compulsion are essential to the success of any employee participation plan. The chief aim of stock participation should be to increase good will among the workers and thereby secure a more efficient organization.

As a rule, the employee should not be encouraged to buy anything but an "investment" interest in the business. That is, the company should sell him preferred stock rather than common stock. Further, it is questionable whether a company which has outstanding senior obligations in the form of bonds should sell even preferred stock to employees. The decision on this matter, however, will depend largely upon the nature of the company and its past record of earnings.

—HARRY KUPPER.

*

Paying a Bonus for Temporary Work

A TEMPORARY man cannot be as valuable to a concern as a steady one until he has become accustomed to the shop surroundings. Should he receive a higher rate than a steady man, he would naturally feel superior to the other employees, a condition not making for shop concord. Any new man can overlook the fact that an old employee receives a few cents more per hour, but no old employee will do his best when he finds that a new man gets more than he does. A foreman can tell an old employee to rush a job through and, knowing the man and his methods of working, knows just what jobs he will do best and how he will do them. Therefore, the old employee will naturally get the more particular work, which should entitle him to a higher rate. Breaking in new men is an expense to any concern, and is enough trouble in itself without a foreman having to cope with wage dissension among his men.

—GEORGE GREETHAM, *Toolroom Foreman, Becker Bros. Electric Corporation.*

*

Radio in the Shop

I KNOW of no machine shop where a radio program loud enough to be heard above the noise of machinery would not disturb the workers. Even though full- and semi-automatic machines may require less attendance, they usually require concentrated attention, and this cannot be given if it is continually being claimed by something else. There may be some erecting shops where it would not be very objectionable, but the fact is that the sound will be so loud as to disturb some men, and at the same time not sufficiently distinct for others to hear without straining.

Although there are still, in some factories, hand operations which are so monotonous that some external interest may not be objectionable, and though the rhythm of the regular rise and fall of a reader's voice may be a help in some occupations, it would be difficult to find the radio program which would produce the same result. I can call to mind several cases, not in the engineering trade, where a roomful of workers performing a hand operation have helped themselves in their work by singing in unison. But progress has played havoc with such cases. Speed is now regulated by conveyor belts, and of rhythm there is none. No music seems to suit, so singing has been "cut out." With a continuous production line system each man's rhythm is, in the nature of things, different, and no music could have a rhythm that would help everyone, though each may help himself by whistling, humming, or singing to suit his own taste. —H. JAMES, *Birmingham, England.*

*

Keeping Posted on New Tools

A FOREMAN who expects to advance in his trade must be constantly on the alert to post himself on every new development; especially those that may later affect the work in his own department. A man should be able to attend to the problems of the present, as they arise, and still have sufficient time to "get a line" on future posiblities. If possible, he should "get the jump" on the superintendent by learning of new developments first.

By reading technical magazines, including the advertising pages, a foreman will secure information on new tools, and then, if he wishes to become more familiar, he can obtain circulars from any firm whose advertisement interests him.

—H. M. DARLING, *Engineer, Wells Tap and Die Company.*

*

Committees for Definite Shop Problems

A REPORT from a committee of workers may be of considerable value but, generally, far more valuable results are attained by a committee that includes executives who are able to give expert information and advice. They must, however, meet the other workers on a basis of equality. The success of the committee depends on the psychological attitude of its members, and it may be some time before each reaches a genuine appreciation of the qualities of the others; but only in such an atmosphere can the best work be done.

Another point is that of authority. No committee whose business it is to consider practical problems, functions satisfactorily for long unless it has authority to have its recommendations put into practice or has among its members individuals who have this authority and are willing to consider themselves at least partly responsible to it.

—H. J. BURNHAM, *Birmingham, England.*

discussion is not limited to foremen. Letters accepted and published will be paid for

IDEAS FROM PRACTICAL MEN

The department, "IDEAS FROM PRACTICAL MEN," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit.

Split Dies for Press Work

BY R. E. MARKS

Split or sectional dies are not new but they are not always used as extensively as seems advisable. The William Schollhorn & Sons shop in New Haven, Conn., uses this type of die on a number of their plier forming and similar operations, an example being shown in Fig. 1. Here the blank is at the left, then the finished stamping, the punch and the split die with a piece in place.

These dies are held together by through bolts and by straps on the top at each end. Heavy dowels also aid in maintaining alignment as can be seen at the left in Fig. 2. There are several advantages in using dies of this construction, among them being that of taking up wear on the sides by separating the parts and grinding the required amount from the mating faces of the die body. Worn points in the form of the die proper can be more easily corrected than in a solid die and, in some cases at least, the formed portion of the die can be more easily shaped where it is in two or more parts.

Details of the construction of the die are shown in Fig. 2 where all the parts, and a finished plier handle, are shown. This view shows how much easier it is to shape the die to form the piece than when the die is solid. It is also easier to harden, there is less danger of cracking, and distortion can be corrected with less difficulty.

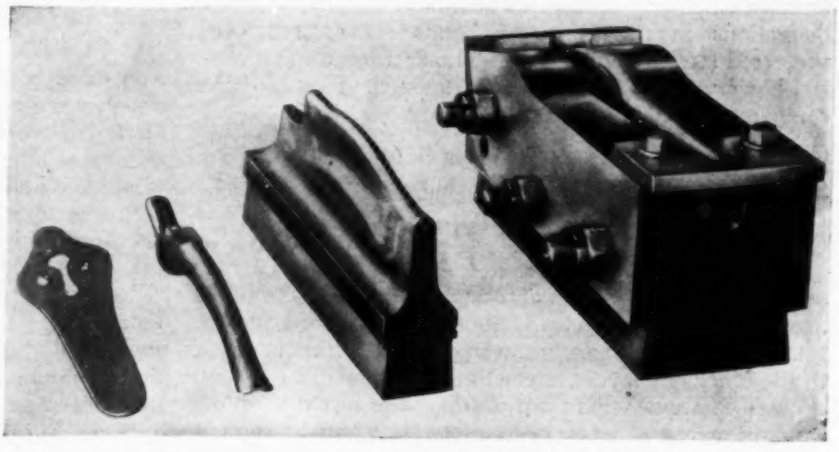


Fig. 1—Split die, punch, blank and finished handle

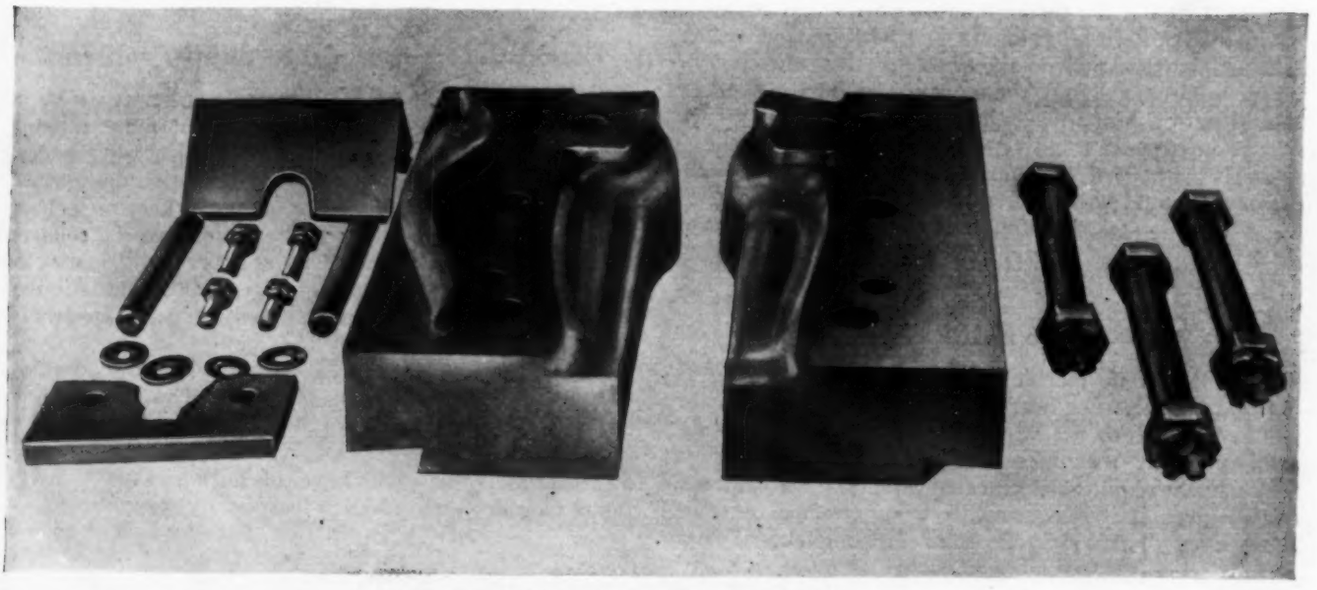


Fig. 2—Details showing construction of die

Repairing a Bulldozer

BY O. B. SERVEL

The method used to repair a large hydraulic bulldozer, weighing seven or eight tons, is illustrated in Fig. 1. The illustration also shows how one of the most modern machine tools is being employed to lengthen the life and usefulness of a machine that has been in constant service

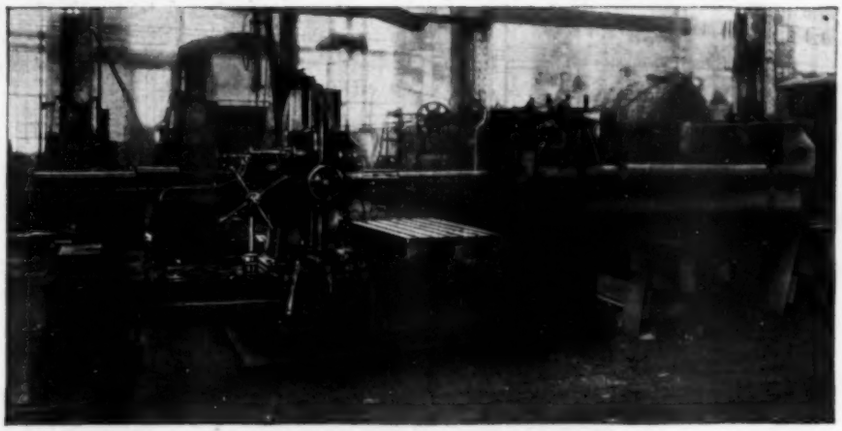


Fig. 1—Reboring for the cylinder lining

for 22 years. This is the first time the bulldozer has required repairs in that period. The repairs were made necessary by the cracking of a small cylinder that is integral with the bed of the machine, the crack coming

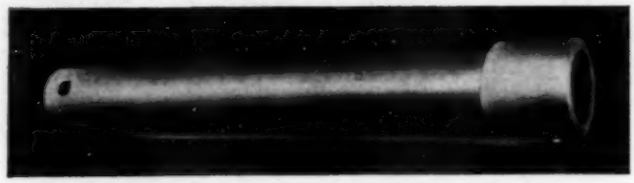


Fig. 2—The liner before being pressed into place

through into the bottom face of the rectangular opening.

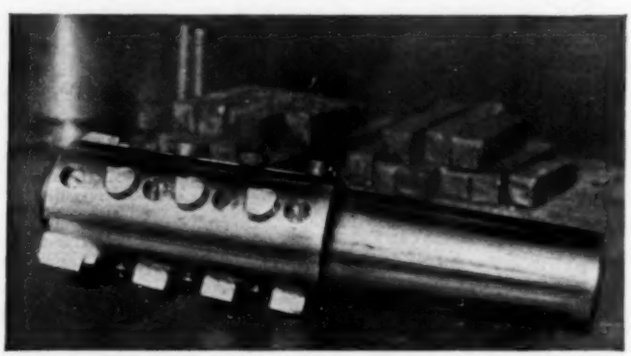
The weight of the bulldozer bed is such that no holding-down bolts were necessary, and it will be noted that the casting is supported by horses instead of by the table of the machine. This view illustrates the usefulness of a horizontal boring machine for repairs on heavy machinery.

The bore of the cracked cylinder was enlarged to suit the steel liner shown in Fig. 2. It was afterwards pressed into the casting.

Boring a Tapered Hole in a Locomotive Crosshead

By Frank J. Oliver, Jr.

Roughing out the tapered hole in a locomotive crosshead for the piston rod to fit is a slow and not always satisfactory job, if done on a boring mill with ordinary tools. In the first place the steel casting is usually cored



Tool designed to rough out a tapered, cored hole

eccentrically to a certain extent, and the tool will therefore deflect on the side of excess metal and produce an out-of-round condition on the roughing cut. This means that several finishing cuts are needed to produce the final taper hole.

With the roughing tool shown the work is considerably simplified. The final hole is 4 in. in diameter at the largest point, and 6 in. deep, with a shoulder at the bottom in which there is a smaller hole $2\frac{3}{4}$ in. in diameter. The purpose of the flat boring bit on the end of the tool, therefore, is to square off and face this shoulder, while the inserted and staggered round bits cut the taper.

Two finishing cuts are taken, the first removing $\frac{3}{16}$ in. of metal at the maximum end of each step, the second removing $\frac{1}{16}$ in. In both cases the boring bar is tilted at the required angle, the taper being $\frac{3}{4}$ in. per ft., and the tool is fed down to the shoulder in the usual way. An ordinary flat bit is used for the first finishing cut, while a special bent-nose tool, forged integral with the shank, is used to take the final cut. The result is a very smooth surface with an accurate taper.

It should be mentioned that the straight hole at the bottom, which is also cored, is drilled after the first rough boring operation. A special drill shank is used, having a sleeve that engages the rough bore and acts as a pilot for the drill.

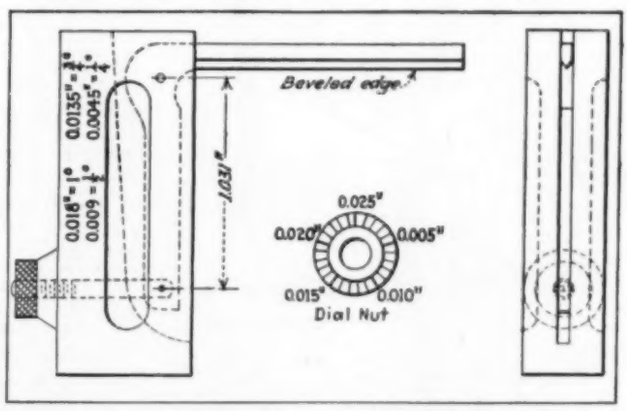
A Draft-Protractor for Diemakers

By A. Dana Seeds

Model Room, Corbin Cabinet Lock Company

A diemakers' protractor that can be easily and instantly set to any of the various angles usually given dies for draft is shown in the illustration.

The blade is L-shaped, one leg extending from the



A diemakers' protractor

stock as in an ordinary square. The other leg is housed in a slot and has a pivoted screw of 40 threads per in. attached to it. The nut is graduated in 25 divisions, each division corresponding to a movement of 0.001 in. of the screw. The edge of the outer leg is ground to a bevel of about 60 deg. Backlash is taken up by a flat spring bearing against the leg within the stock.

Since the tangent of 1 deg. at a radius of 1 is 0.01746,

at a radius of 1.031 in. it is 0.018 in. Thus, by making the distance between the holes where the blade and the screw are pivoted 1.031 in., as shown in the illustration, a movement of 0.018 in. of the screw will move the blade 1 deg. As the proportional parts of the tangents of very small angles are equal to the proportional parts of the angles they represent, parts of angles can be found by dividing the tangent of 1 deg. by the part wanted, and consequently the screw can be moved by the nut accordingly.

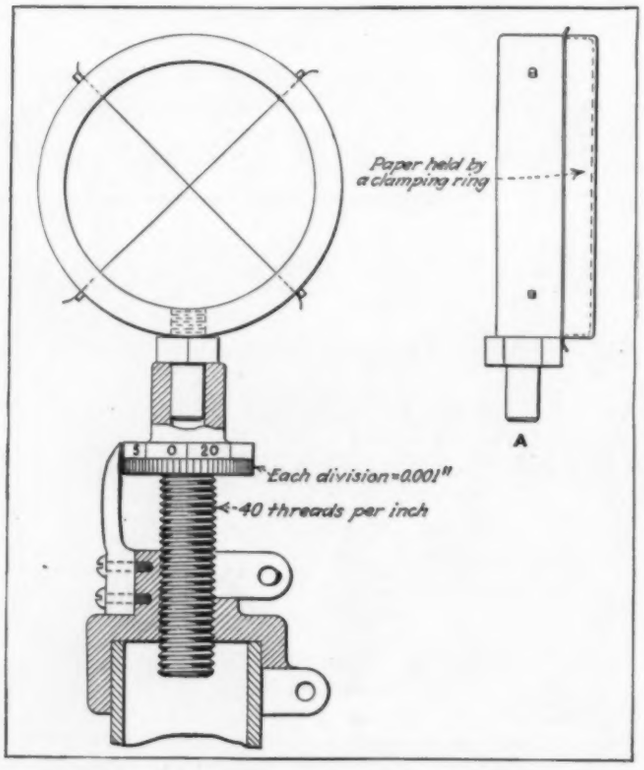
Thus, a movement of the screw of 0.018 in. equals a movement of the blade of 1 deg.; 0.135 in., ¾ deg.; 0.009 in., ½ deg., and 0.0045 in., ¼ deg., and so on. The readings of the nut for an angle of 1 deg. and for the subdivisions noted above should be stamped on the stock of the protractor.

Measuring Within 0.004 in. With a Transit—*Discussion*

By E. J. Jordan

With reference to an article on the above subject by K. K. Hoyt on page 215, Vol. 70, of the *American Machinist*, the illustration shows a target that increases appreciably the accuracy of a transit in such work as leveling machinery.

The ordinary transit has a blind spot of approximately 0.003 in. because of the cross-hair. When the transit is leveled at another horizontal line on the target, the two lines combined cause inaccuracy. If, however, two diagonal hairs are used, crossing at the center of the target, the accuracy is increased, because the uneven angles above and below the horizontal are easily detected.



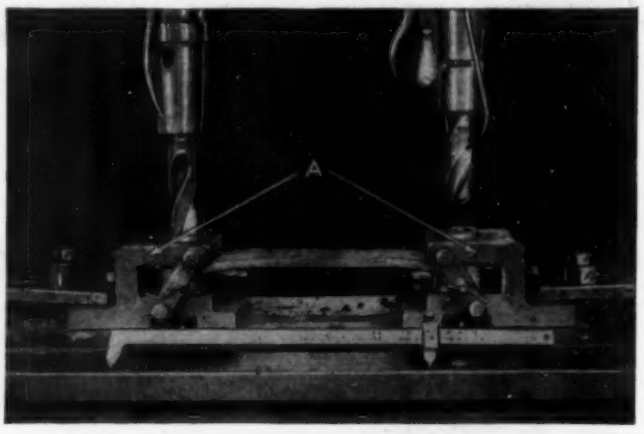
The target with diagonal cross-hairs. At *A* is shown the method of fastening the background on white paper, back of which the light is placed to illuminate the cross-hairs in front of the target

If a piece of white paper is fastened to the back of the target and illuminated from behind, it produces two silhouettes against a light background, and the accuracy of the transit comes within 0.002 in. at 40 feet.

Gage Simplifies Setting of Drill Jigs

By H. P. Leonard

Where a large variety of locomotives is serviced, such as in the Chicago shops of the Chicago & North Western Railway Company, spring hanger links are found in a wide variety of lengths, but with standard ends and pin



A simple trammel gage used to set drill jigs

holes. These holes are generally $2\frac{1}{16}$-in. in diameter to accommodate a 2-in. pin. When the holes are worn, it is the practice to fill them up by gas welding, and to re-drill them simultaneously in a multiple drill press.

Because the ends are uniform, standard jigs are used, and it is only necessary to space them the correct distance apart and to shift the drill heads along the rail to correspond. Ordinarily this set-up would require the services of a skilled mechanic, but by means of the simple gage bar, shown at the bottom of the illustration, the entire job can be done by the regular drill operator. In principle of design this gage resembles a trammel, or beam, compass with one fixed and one movable center. Holes are drilled in the beam at suitable intervals corresponding to the various hanger lengths, and the movable center is pinned in the position desired by a wire passing through one of two holes in its body. With the gage thus set it is only necessary for the operator to clamp one jig to the table and to shift the other until the two gage points on the jigs, shown at *A* in the illustration, are the required distance apart as determined by the gage bar.

During the drilling operation each end of the hanger is clamped in its respective jig by means of a latch and set-screw. A capstan rod runs through the square head of the set-screw so that hand and hammer may be used to tighten it.

End play liners on locomotive driving boxes are now being built up by welding them directly to the cast-steel box. Thus, the trouble formerly caused by the loosening of the liners has been eliminated. It was due to contraction of the brass liner after cooling and consequent pulling away from the box.

Types of Commercial Plumb Bobs

PLUMB BOBS, formerly an essential part of the kit of any artisan, have been considered less important since the advent of the spirit level. The occasional machinist who possesses one rarely considers it as a precision instrument, and consequently pays but little attention to its design or use. Many machinists consider a handy nut, brick, or piece of scrap iron a good substitute.

Such makeshifts might be considered as accurate in some cases as some "top-shaped" plumb bobs, particularly where only the line holding the bob is used for reference. Many commercial bobs, illustrated in Figs. 8, 9, 11, and 13, although nickeled or finished, are simply castings with the gates ground off and a hole drilled in. Others, similar to Fig. 1, have a wire eye inserted. None of these can be exact, as can be proved by suspending them and rotating them slowly, noting the circle described by the point. Any error in drilling or in poor weight distribution is magnified by the distance between the center of gravity—which will center itself directly under the line of the cord—and the point. This results in greater inaccuracy at the point.

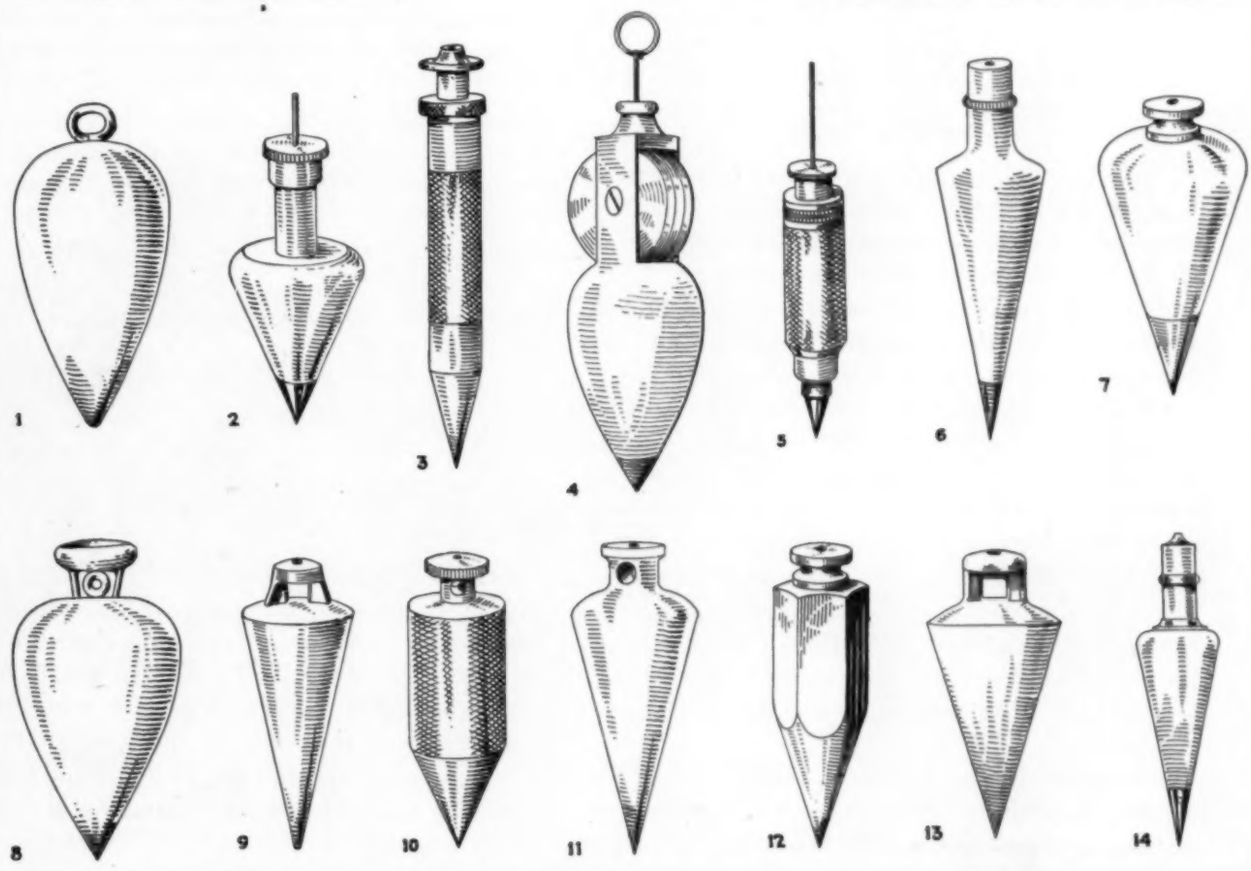
Similar bobs are made of malleable or brass castings, with either cast or screw-cap cord fastening and steel point, such as those illustrated in Figs. 4, 7, and 14. They are made in various shapes and finished all over, but there is still an opportunity for inaccuracy because of the distance between the center of gravity and the point.

A plumb bob of the shape illustrated in Fig. 2 has its center of gravity lower. Another method of achieving this result is by filling the bob with mercury or lead, as in Figs. 3 and 7, if the filling is placed as close to the point as possible.

In the Krupp works in Germany, the standard plumb bob is a small-diameter pencil of hardened steel, threaded at the upper end to receive a screw-cap, and having a steel ball shrunk on just above the point. When one point wears out, the bob is heated, the pencil taken out, and a new one inserted. The center of gravity of this type of bob is as near the point as possible, giving extreme accuracy.

The types of bobs illustrated in Figs. 2, 3, 5, 6, 10, and 12 are machined from bar stock and are accurate. They have hardened-steel points inserted. Knurling, polishing, and nickel-plating are used to improve the outside appearance, and to increase sales value. Another type of bob, illustrated in Fig. 12, is made hexagonal to prevent rolling. To the machinist, this makes little difference.

Many specialized plumb bobs are manufactured. Several, such as the one illustrated in Fig. 4, carry reels for the cord, either within the bob or above it, using friction stops to hold the cord at any point of its length.



© American Machinist

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Vol. 71 NEW YORK, NOVEMBER 7, 1929 No. 19

Commercial Statistics on Gears

AT THE recent meeting of the American Gear Manufacturers' Association several of the more important executive members present agreed to contribute statistics on orders and shipments, if a proper plan for handling them could be developed. These gentlemen are to be commended for their progressive attitude. Some of them, at least, have had experience in other industries where the collection of such figures is well organized. They know how important it is to the planning executive to have some sort of a chart by which to guide his course. And from their experience in the gear business they know how hard it is to guide a course without such aid. The machinery is simple. It is to be hoped that it will soon be set in motion to give the gear manufacturers who contribute statistics the sort of help that has been so valuable to the machine tool builders.

*

Growing Pains

ONCE UPON a time a wise man said that the strength and the weakness of the American people lie in an uncanny ability to go to extremes. If the wise man be still alive, he must be chuckling quietly over the five million and six million and sixteen million share days on the New York Exchange—unless he too has been in the market.

Obviously enough, the Exchange has a most vital place in our economic life; it is, and should be, a convenient meeting place for those who would buy or sell or exchange. It is, but it should never be, a legalized gaming place fit to stir the envy and admiration of a thousand Canfields. Used legitimately as an exchange, it is a true barometer of demand and value, a market place for securities which are secure; used as a Monte Carlo, it is a national disgrace and a financial quagmire.

Too recently for comfort, hysteria stole the mantle of common sense. True value became as nothing. "They" said that Grindless Grinders common was going up; the public bought. "They" said that Grindless Grinders was to publish an unfavorable statement; the public sold. "They" said, or some self-nominated expert said, that the market was due for a drastic decline; the public rushed in to sell and the decline was just that much more drastic. The whole painful debacle was most immature and silly.

But the insanity of reckless extremes may some day give way to sanity. Manufacturers and merchants may again give more attention to their own businesses than to the stock market and the omnipresent ticker. The New York Exchange may again be employed as a convenient meeting place for those who would buy or sell or exchange their securities. In a word, the American people may grow up.

*

Plumb Bobs and Standardization

SUCH a comparatively small item as a plumb bob is rarely thought of as offering possible field for a concerted effort at standardization, but when its use in placing machines and parts is considered it becomes more important, especially when the necessity for absolute accuracy in this work is given its proper weight.

Fourteen standard types of plumb bobs are illustrated on the preceding page. These are but a few of the many types being manufactured and sold at the present time. In all this profusion, there are but few that possess sufficient accuracy to make them fit for use by the toolmaker or machinist in point transfer. The old "top-shaped" plumb bob had its advantage of good visibility at the point, but the high center of gravity and consequent chance for error make it useless to the machinist who wishes to locate a point accurately by dropping the bob.

Standardization of plumb bobs can mean savings for manufacturer and user alike. A period of research preceding the standardization would not come amiss.

*

Mr. MacDonald has gone home. To a united British Empire he takes the good wishes of a united American Nation. To individual American citizens he is the sign and symbol of kindly British good-will, good-will founded upon the rocks of truth and mutual confidence and justice. His, he may truly feel, is a towering personal and imperial triumph. May he never be "sae lang in coming" again.

SHOP EQUIPMENT NEWS

Greenlee Four-Spindle Automatic Screw Machine

OFFERED in two sizes, both of which are equipped with a leadscrew threading mechanism that permits the use of threading, tapping, reaming, chamfering, corner rounding, and other tools in the third and fourth positions, the four-spindle automatic screw machine illustrated in Fig. 1 has been placed on the market by the Greenlee Bros. & Company, Rockford, Ill. Accurate threads are produced by this mechanism, which is especially useful for cutting short threads without damaging the lead of the first thread. The two sizes will chuck 1¼- and 1¾-in. round stock, respectively. Other specifications are listed in the accompanying table.

The range of work that these machines can turn out is wide because of the design of the forming slides, each of the four slides being handled individually for independent operation in all positions, because the stock feed occurs between the third and fourth positions. All threading and tapping can also be handled in either or both the third and fourth positions. Cams are easily changed for different set-ups and are also interchangeable for different positions.

Instead of the usual tool slide camming, the slide is controlled by a rack and intermittent gearing, insuring very smooth feed. An adjusting dog on the feed worm gear takes care of all setting for the various lengths of feed. A two-speed clutch mechanism eliminates the usual drum cam changes. The collet closing and stock feeding rings are loose on the sleeves to minimize wear of the shoes. Collet closing rings are oiled from the spindles, while the stock rings are oiled by a large reservoir in each ring.

Spindles are mounted on double Timken bearings with a helical drive gear between. Anti-friction bearings and alloy-steel, heat-treated gears are used throughout the machine. A lubricating pump is built into the gearbox to furnish pressure lubrication to the head, feed-box, and the entire machine.

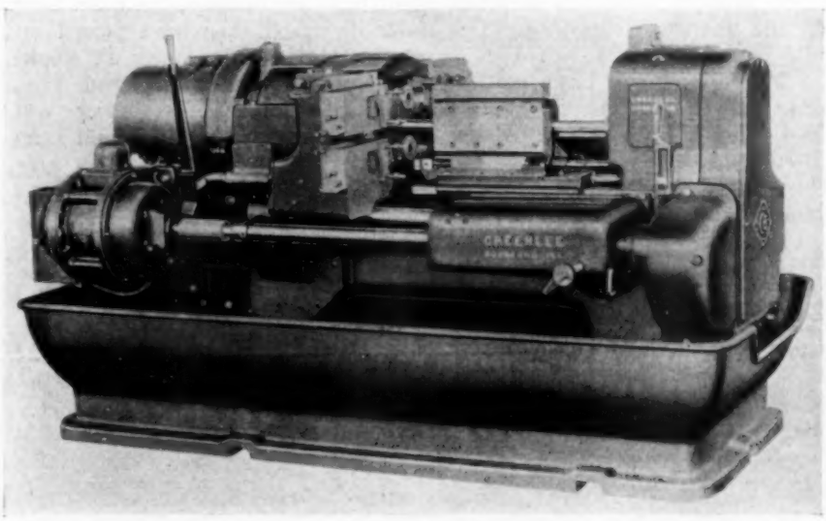


Fig. 1—Greenlee Four-Spindle Automatic Screw Machine which has a leadscrew mechanism for threading or tapping in either or both of the third or fourth positions

This construction increases the variety of forming operations that can be handled. In addition, the tool slide permits the use of end-working tools

A built-in system for the distribution of the coolant carries the cutting compound through the tool and forming slides, and the passages in each of the tool holders, direct to the cutting tools. Very little coolant piping is exposed, and with this arrangement, together with the open construction of the spindles and slides, it is easier for the operator to change set-ups.

Fig. 2—Close-up of the four forming slides, which have independent feed, and the V-type bed which prevents chip accumulations

A push-button motor control, cutting-compound control valve, and a feed start and stop lever are accessible from either side of the machine. An interlock is provided between the hand turnover and the feed control lever so that the hand and power feed can not be engaged at the same time. A safety clutch, which is adjustable for

SPECIFICATIONS

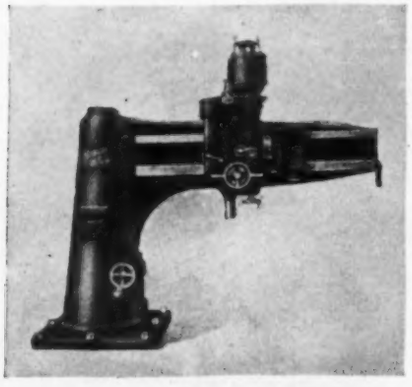
Machine	1¼ In.	1¾ In.
Chuck capacity, rounds, in.	1¼	1¾
Chuck capacity, hexagons, in.	1⅛	1⅝
Chuck capacity, squares, in.	⅞	1¼
Stock feed, in	7¼	9
Milling, length, in	6	7½
Motor size, hp	7½	10
Speed of motor, r.p.m.	1,200	1,200
Floor space,		
Length with stock reel, ft.	15	13½
Length without stock reel, ft.	8½	9½
Width, in	46	57½
Height, ft.	4½	5
Approximate weight, belt drive, lb.	7,800	11,700
Approximate weight, motor drive, lb.	8,250	12,000

different classes of work, is provided in case of overloads or jamming of the stock between the tool slide and the head. A hand lever is built into the machine for opening and closing the collet in the number one position. The collet closing fingers are counterbalanced to minimize the effects of centrifugal force.

The oil pan is of heavy cast-iron construction with a capacity of 60 gallons of coolant on the 1¼-in. machine and 70 gallons on the 1¾-in. machine. The motor is mounted on a bracket at the head end of the machine away from all chips and oil. Drive is through helical, alloy-steel gears which are totally-inclosed and run in oil. Belt drive can be furnished and the change from the one type of drive to the other can be made at any time.

Braun Radial Drilling Machines

SIMPLICITY of the saddles, centralized control, and ease of adjustment are the features in the Models ERB-40 and ERB-70 radial drilling machines placed on the market in the United States by the United Machine Tool Corporation, 75 West St., New York, N. Y. The machines are manufactured by Franz Braun, A.G., Zerbst, Germany.



Braun Model ERB-70 Radial Drilling Machine

Easy swiveling of the arm on the column is a feature. The column is in two pieces, an inner and an outer section. The inner column is cast in one piece with a foot of large diameter. On this inner column the outer column with the integral arm swings a full 360 deg. To insure easy movement the upper portion of the outer column is fitted with radial and thrust ball bearings. In Model ERB-40 the lower end of the outer column runs on the whole of the periphery on rollers held in a cage, while on the Model ERB-70 it is supported on two adjustable rollers running on ball bearings. The outer column is clamped by a wedge. This construction takes care of the side thrust due to feed pressure and the overhang of the saddle and the arm.

The arm is a substantial box casting of bow construction. It is strongly reinforced by ribs and has great rigidity even when the saddle is at the extreme end.

The saddle or head is made in two sizes. It traverses along the arm by means of a handwheel located on the same shaft as the double-ended lever controlling the quick vertical adjustment of the spindles. Thus the two most important controls are located one behind the other. Provision of adjustable rollers running on ball bearings insures an easy movement and quick adjustment of the drill. The drill spindle runs in an extra long quill and has large phosphor-bronze bearings. Axial pressure in both directions is taken up by the ball thrust bearings. The spindle is fitted with a No. 4 or a No. 5 Morse taper. It has a vertical traverse of 12 in. for the Model ERB-40 and 15¾ in. for the Model ERB-70.

Three means are provided for the control of the feeds, two manual, and one automatic or power feed; the double-ended lever for rapid control, the small handwheel for accurate spotting, and the power lever for adjusting or changing the automatic feed. The one speed given by a constant-speed motor on the Type ERB-40 is 750 r.p.m., and on the ERB-70, 500 r.p.m. There is no change of speed either electrically or mechanically with this equipment.

The Model ERB-40 is equipped with a 3-phase, 60-cycle, 220-volt, 3-hp. 2,800 r.p.m., a.c. motor of the squirrel-cage or slip-ring type. A reversing-type starter fuse box and main switch are supplied. The Model ERB-70 has a 5½ hp., 1,450 r.p.m. motor for the same type of circuit.

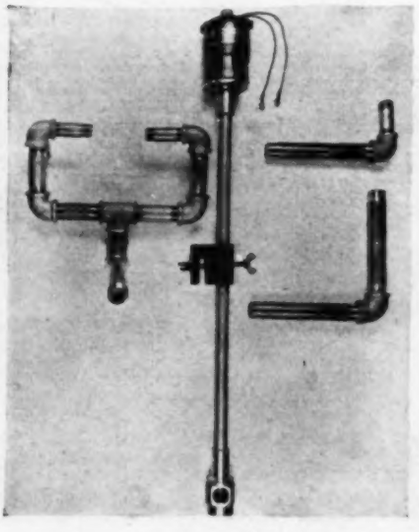
Alliance Style 1945 Planer Jacks

Jacks for use on planers, milling machines, and shapers, known as Style 1945, have been placed on the market by the Alliance Tool Company, Alliance, Ohio. Edges and ends are finished by grinding and with the screws removed, they make solid blocks that will fit in a great many cases. They are made in five sizes, 2, 3, 4, 5, and 6 inches.

Alliance Style 1945 Planer Jacks

Rockwell Quenching Tank Agitator

For forcing a stream of quenching liquid (oil, water or brine) against the face or faces of dies, assuring uniform hardening because of freedom from air bubbles, the quenching tank illustrated has been placed on the market by the Stanley P. Rockwell Company, 296 Homestead Ave., Hartford, Conn. The device will agitate the quenching bath and keep



Rockwell Quenching Tank Agitator

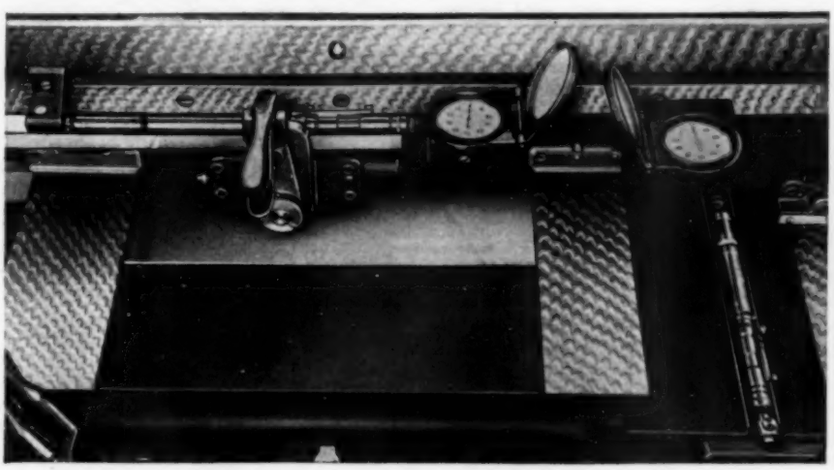
it at a uniform temperature throughout. Furthermore, it is of use in fire protection as it pumps the cold liquid at the bottom of the tank to the top, thereby keeping the quenching oil at the top at a safe temperature.

The device weighs 16 lb., and has a vertical adjustment of 26 in. It can be attached instantly to any quenching tank, and is arranged for 1-in. standard pipe fittings. The motor is a standard 110-volt, 60-cycle, 10,000 r.p.m. type driving a specially-designed screw pump, ball-bearing equipped and using brass fittings.

Indicating Devices for Reed-Prentice No. 5 Jig Borer and Vertical Milling Machine

Longitudinal and cross table indicating devices, as shown in the accompanying illustration, have been developed for use on the No. 5 jig boring and vertical milling machine manufactured by the Reed-Prentice Corporation, Worcester, Mass. The machine itself was previously described on page 485, Vol. 71, of the *American Machinist*.

For accuracy, as in jigs and fixtures, brackets with V-blocks are provided for holding end measures and differential micrometer heads, as shown in Figs. 3 and 4 of the above-mentioned announcement. These end measures and micrometer heads are placed between the adjustable stops and the dial gages attached to the saddle. Two differential micrometer heads with twelve end measures provide adjustments ranging from 1 to 12 in. by one-tenth of a thousandth. Holes are located accurately in either direction, cross or longitudinal, with direct readings. Positioning the table and work is accurately controlled by end measures, inside micrometers, and dial indicators—not by means of cross or longitudinal feed screws. A clamping or locking device is also provided for clamping the table to the saddle and the saddle to the base of the machine, thus insuring rigidity and accuracy.



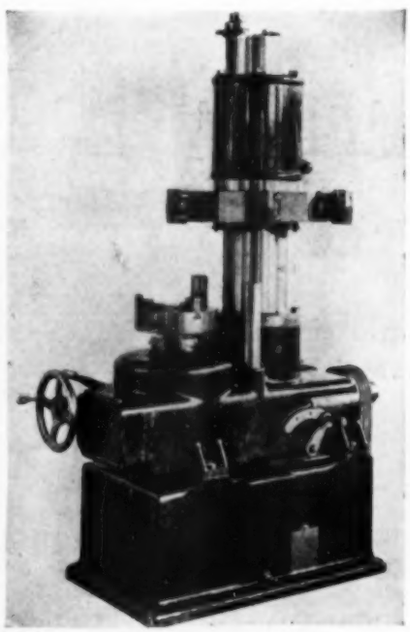
Close-up showing Longitudinal and Cross-Feed Indicating Devices on the Reed-Prentice No. 5 Jig Boring and Vertical Milling Machine

"Production" Vertical Chucking Machine

A VERTICAL chucking machine that will perform any operation such as turning, boring facing, drilling, counterboring, recessing, threading, and similar operations, within its range, is being built by the Columbia Machine Tool Company, exclusively for the Production Machinery Sales Company, 4845 St. Aubin Ave., Detroit, Mich. The machine is so designed as to conserve floor space, and to make possible the arrangement of any number of machine units either in line or in horseshoe formation, with a maximum distance of but 36 in. between spindles on adjacent machines. Thus, one operator can handle several machines easily.

The manufacturer claims the advantages of constant down thrust and alignment at all speeds for the machine because of its vertical-spindle construction, in addition to ease in loading and unloading the chuck or fixture mounted on the spindle. The machine is also claimed to be able to finish parts with ease and accuracy, meanwhile giving the operator an unobstructed view of the work and the cutting tools. The horizontal rotating turret is indexed automatically with tools on the hexagonal faces and on the lower faces.

The machine base is low hung, and is of sturdy construction. All shafts are mounted in Timken tapered roller bearings, including the vertical spindle. All spindles operate in a flood of oil, an essential at the high speeds required for the use of tungsten-carbide and other high-speed tools. It is understood that spindle speeds of up to 2,200 r.p.m. can be had.



"Production" Vertical Chucking Machine

The levers for control of the machine are conveniently located and are simple in operation. The turret motion is eangaged by turning the handwheel, and the turret power down-feed is engaged by pushing in the wheel. The power feed can be disengaged automatically at any predetermined point. Turret feed is independent of spindle speed, thus enabling the selection of the proper feed at any spindle speed. The machine can be supplied with hand or power

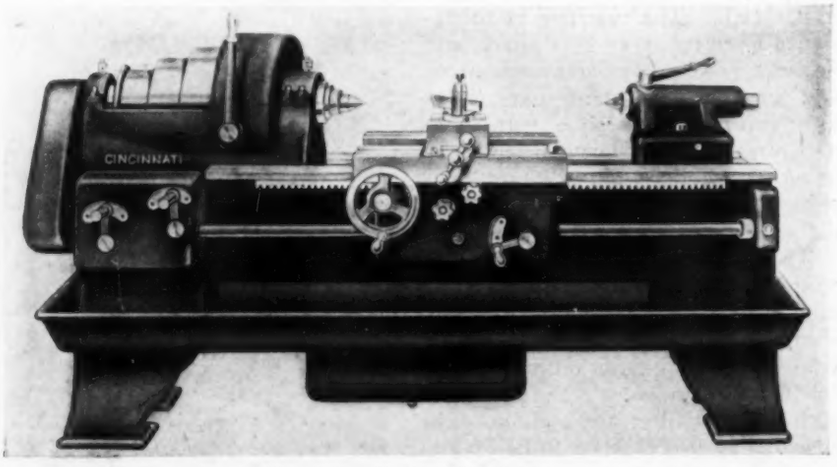
feed, or with hydraulic feed to the turret.

The machine will chuck work up to 16 in. in diameter, and will drill or bore to a depth of 9 in. Because of the design, however, the machine can be furnished with a longer column to bore to any reasonable depth. The machine will accommodate any standard tool used on machines of this type, and can also use an air chuck, lever draw-in or push-out collects, or special features.

The drive is by self-contained motor through V-type cog belts. Floor space required is 26x42 inches.

Cincinnati "Maxi-Production" Lathe

A SPINDLE speed of 1,000 r.p.m. or more is available on the "Maxi-Production" lathe for obtaining the best results from tungsten-carbide tipped tools. This spindle is made from a 0.60 carbon steel forging and has a $2\frac{3}{8}$-in. hole clear through for bar stock. Timken bearings are employed in the spindle mounting. By operating a lever on the headstock, the spindle is stopped and started instantly through a positive friction clutch and brake, but the cone continues to run until stopped by the countershaft clutch. The lathe has been placed on the market by the Cincinnati Lathe & Tool Company, 3207-3211 Disney St., Oakley, Cincinnati, Ohio.



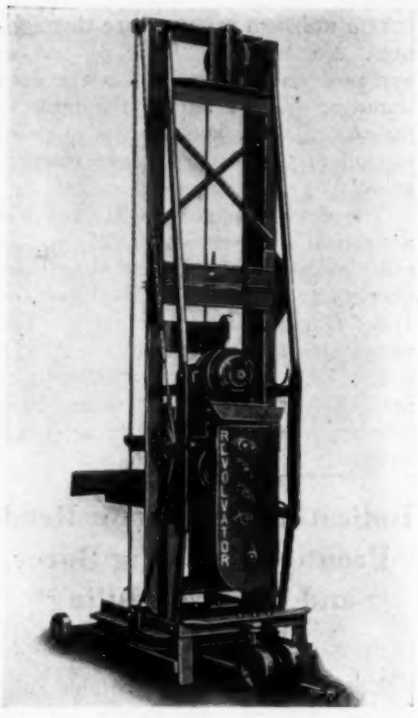
Cincinnati "Maxi-Production" Lathe

The headstock has been strengthened materially and affords protection against a revolving pulley or belting. It may be supplied with or without backgears. The tailstock permits a wide range of adjustments at different angles of the compound rest. Either a quick-acting or the standard screw feed arrangement may be furnished. The feed box covers a very wide range of feeds from coarse to fine feeds and it may be replaced at any time with a quick-change device for screw cutting. A plain rest is provided with regular equipment, but any of the standard rests or turret attachments can be applied.

Regular equipment includes: Double-plate apron, plain block rest, bushing with two centers, self-oiling, two-speed counter-shaft, automatic stop, screw-operated tailstock, large and small faceplates, and the necessary wrenches. Extra equipment includes turrets on the bed or carriage, taper or draw-in attachments, oil pan, pump, quick-acting tailstock, connected toolrests, and a belt shifter.

Revolvator "Red Giant" Portable Elevator

Capacity to lift up to 2,000 lb. at a rate of 35 ft. per minute is found in the Model M "Red Giant" portable elevator manufactured by the Revolvator Company, 336-352 Garfield Ave., Jersey City, N. J. Other models are available of similar construction for loads up to 6,000 lb. The speed of 35 ft. per minute is obtained by the use of a silent-chain, spur-gear drive, which is much faster than a worm gear drive.



Revolvator Model M "Red Giant" Portable Elevator

The principal features of the hoist are the inclosed hoist unit, Z-bar upright construction, and the floor-lock. The hoist unit not only houses the gears, but also the cable drum as well, and is fitted with a compartment to contain oil. Splash lubrication is obtained by means of the rotation of the gears. The Z-bar upright frame forms parallel tracks for the platform guide rollers, which work on opposite sides of the Z-bar flange. These bars form straight tracks for the platform supporting rollers, minimize sliding friction on the face of the tapered rollers running on the tapered track, and form a side wall for attaching the base frame. The other flange presents a broad area for the attachment of the cross bracing. The use of these sections reduces the twisting moment and simplifies the construction.

The dumping type of floor-lock has a vertical lift and the pull handle is detachable so that it may be laid on the floor, stood up against the machine, turned around to one side to be out of the way, and lift and lower the elevator within an arc of 200 deg. The Revolvator is electrically welded throughout.

An automatic top and bottom mechanical limit stop functioning with control chain, brings the platform to a stop when it reaches the top or bottom of the machine.

The machine may be arranged for operation on any commercial circuit. It is equipped with a motor, 25 ft. of cable, reversible switch, plug, receptacle, and wall box. A solenoid-operated brake is an additional safety feature that is special equipment.

The machine is made in various heights from 10 to 20 ft., lengths from 50 to 72 in., and lifts from 5 to 18 feet.

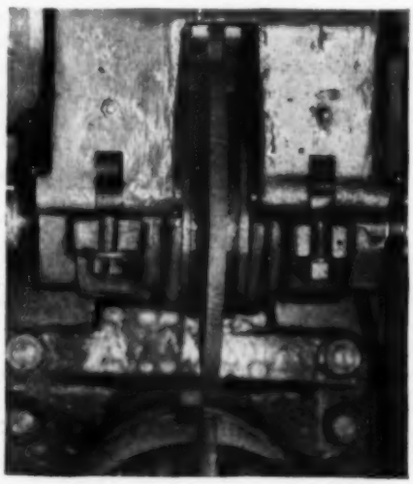


Fig. 3—Close-up of the hardened knurling roll shown in contact with the upper welding roll

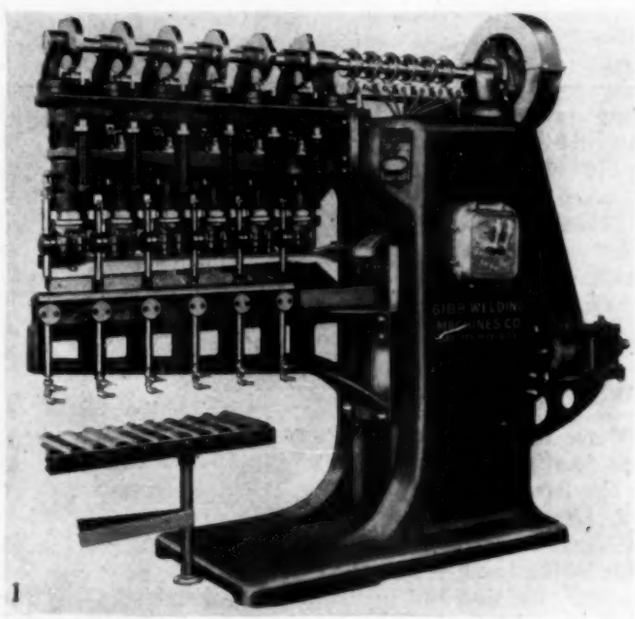
Gibb Barrel-Welding Equipment

LAP welding of 16- and 18-gage sheet into cylinders for steel barrels by means of the "Gibseaming" process has been announced by the Gibb Welding Machines Company, Bay City, Mich. The process consists of spotwelding the formed sheet on the multiple-head spot welder shown in Fig. 1 and then lap welding the entire seam on the "Gibseamer" shown in Fig. 2. A production of 100 barrels per hour is common, but 120 units may be obtained. The equipment will seam cylinders 37 in. long without reversing, and 74 in. when they are reversed. The range of diameters handled is from 14 to 36 inches.

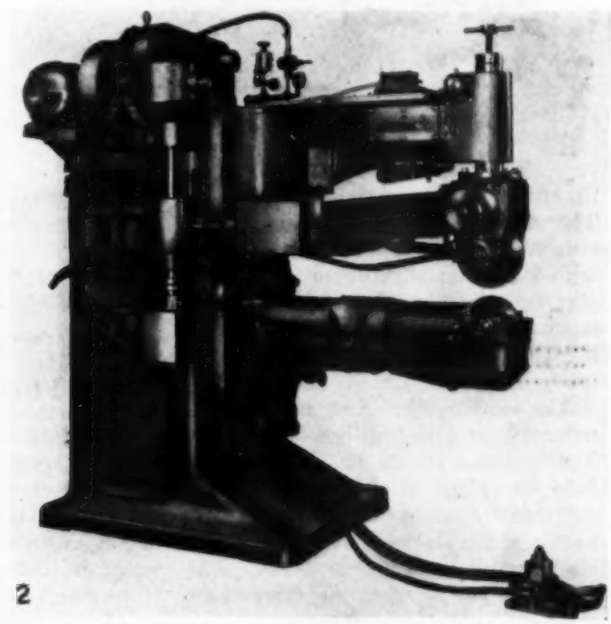
Six cam-operated spot-welding electrodes are driven by a flywheel on the spot welder. These electrodes are water-cooled. On the drive shaft, between the cams for operating the electrodes and the flywheel, there will be noted a series of cams which are used for distributing the current to the various electrodes as they operate separately through the cycle. This timing is necessary so that excessive current will not be drawn at any one moment. A roller conveyor serves to support the cylinder while in the machine. The over-all dimensions are 9 ft. 3 in. long by 7 ft. high by 30 in. wide. The weight is 3,600 lb. A 1-hp. motor furnishes the drive.

The outstanding feature of the Gibseamer is the use of knurls to drive the welding rolls. As shown in Fig. 3, the hardened knurling roll has a knurled surface at the bottom of a peripheral groove. The knurled surface knurls the face of the welding roll to give it the proper tractive properties. The hardened edges of the groove shear off whatever weld metal adheres to the welding roll and maintain its width, so that the welding is even and the current demand is constant. In operation, it has been found that one pair of rolls will handle 25,000 barrels without attention. For the machine illustrated, the over-all dimensions are approximately 6 ft. 2½ in. long by 6 ft. 10½ in. high by 34 in. wide. The weight is 6,500 pounds.

Gibseamers are available in three standard types, the Nos. 3, 4, and 5, but the great majority of installations are special. All machines are arranged so that either a straight or circular seaming arm may be inserted in the lower horn. This permits the machine to make either straight or



1



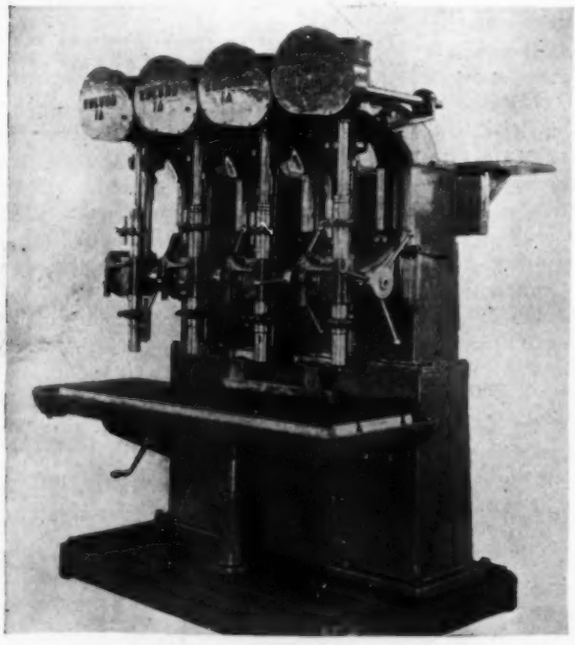
2

Fig. 1—Gibb Multiple-Head Spot-Welding Machine which has six electrodes. Fig. 2—"Gibseamer Welding Machine for lap welding steel cylinders after they have been multiple spot welded

circular seams. The upper seaming roll will swivel into position. Machines are so arranged that there are periodic interruptions of the current without interruption of the travel of the seam rolls. The surges of current have penetrating effect without an accumulation of heat. This preserves the uniform conditions necessary to sound and leak-proof seams and also permits of a high rate of seaming speed.

Edlund No. 1A, 24-Inch Production-Type Drilling Machine

UP TO four spindles may be provided on the No. 1A, 24-in. production-type drilling machine announced by the Edlund Machinery Company, Inc., Cortland, N. Y. The machine may be furnished with either hand or power feed, but not with a tapping attachment. Spindles may be either No. 3 or No. 4 Morse taper and may have flanged quills if required. Riser blocks may be used.



Edlund No. 1A, 24-Inch Production-Type Drilling Machine

The motor for this machine is mounted on a sliding bracket so that it may be removed and another put into its place if found necessary. Adjustment of the alignment of the motor shaft and drive shaft may be made without the use of shims. The motor is connected to the drive shaft through a flexible coupling.

Hardened steel change gears are used in the gear case at the front of the machine. These gears are broached with two keys so that no loose parts are used. The jackshaft that carries the large change gear also carries a spiral bevel pinion, which drives a gear mounted on a four-splined broached sleeve, which in turn drives the spindle. The spindle assembly is the same as on No. 4B machine. The power feed is driven through a train of gears with change gears at the top so that any feed, ranging from 0.006 to 0.028 in. per revolution may be obtained. Both the sliding arm and the power feed worm gear box assemblies are the same on the No. 4B machine.

The machine is open in the back to allow for the use of extra counterweights for multiple-head drilling. These weights may be taken off or put on as required. When a coolant system is required, a bracket is mounted at the side of the base to carry an independent pump.

Apex Floating Tap Sleeve

A floating tap sleeve to take hand taps and pipe taps has been placed on the market by the Apex Machine Company, Dayton, Ohio. The device is made with Morse tapers from 1 to 5 inclusive, for taking hand taps from the No. 6 to the 1¼-in. size, and in Morse tapers of 2, 3, 4, and 5 to take ⅛- to 1-in. pipe taps. The tap is driven by the square and held

Apex Floating Tap Sleeve

in the sleeve the same as in all standard Apex tap collets. The bore and square being larger than the tap shank and square, the tap is free to float and follow the hole, thereby correcting misalignment between tap and work. The sleeve is for use in single and multiple tapping operations, and can be used in any position. It is especially suitable for two- or three-way automatic multiple-tapping machines.

Blount All-Purpose Tool Grinder

The J. G. Blount Company, Everett, Mass., has announced an all-purpose tool grinder that is adaptable for use in either the wood shop or the general shop. This grinder is driven by a 1-hp., 1,750 r.p.m., fully-inclosed, dust-proof Westinghouse motor.

This grinder is provided with three wheels. A coarse wheel, 10 by 1½ in., is for general shop use and on this all snagging or rough grinding can be done. A fine wheel of the same size is provided for the grinding of tools, chisels, and plane irons. To facilitate these last operations, this wheel is provided with a special rest, fully adjustable as to

Blount All-Purpose Tool Grinder

the angle with the wheel face, to which is fitted a screw-feed sliding-clamp block for holding the tool and guiding it square across the wheel. This attachment assures the rapid grinding of tools to correct angle and curvature. For the grinding of gages and inside curved tools, a grinding cone is provided.

This machine is of the motor-in-head type. The spindle is extra heavy and runs in heavy-duty, deep-groove ball bearings. Double recessing of the flanges provides a double seal against grit and dust entering either the bearings or the motor. The wheels are fitted with fully-enclosing, approved safety guards that are fully adjustable to wheel wear as are also the toolrests.

Gardner No. 3-DA Double-Spindle Polishing Lathe

ANOTHER "Speed-U-Need" polishing lathe, the No. 3-DA, has been developed by the Gardner Machine Company, Beloit, Wis. This unit is built with two single-end wheel spindles driven by multiple V-belts from double shaft extensions on the motor in the base. Both multiple sheaves run loose on the motor shafts and are engaged by means of friction clutches operated by handles at the top of the machine. If it is desired to operate the two spindle ends at different speeds, it can be accomplished easily by equipping the motor shaft with sheaves of different diameters. Adjustment means for varying the belt lengths are provided, and, in case of breakage, replacement can be made in a few minutes without disturbing the bearing mountings on the spindles. As the illustration shows, the belts and sheaves are completely inclosed.

The base is a solid, one-piece casting of such sturdy construction that the net weight of the lathe, complete with the 5-hp. motor is 1,225 lb. The mounting of the motor on a bracket at the rear of the base provides a very compact, floor-space saving design. The base measures 30x25 in. The semi-projecting type of base gives a slight overhang of the spindle.

The spindles are $2\frac{1}{4}$ in. in diameter at the bearings, with a $1\frac{1}{4}$-in. diameter arbor. A double-row Timken adjustable bearing is used at each end of the spindle unit, and each bearing is mounted in a dustproof cartridge, which may be removed from the base without disturbing the bearing mounting on the spindle. Each entire spindle assembly can be removed as a unit. The spindle locks are placed near the center of the machine, where they are accessible to the operators and yet not in a position where they will interfere with the work. The use of spindle safety nuts, double-capped oil holes and similar features assure long life with minimum attention, even under severe operating conditions.

A magnetic-type starter is used, with a push-button station mounted in the recess on the front of the base. The motor furnished regularly with this lathe is of the inclosed, fan-cooled, ball-bearing type, with adjustment for varying the belt lengths.

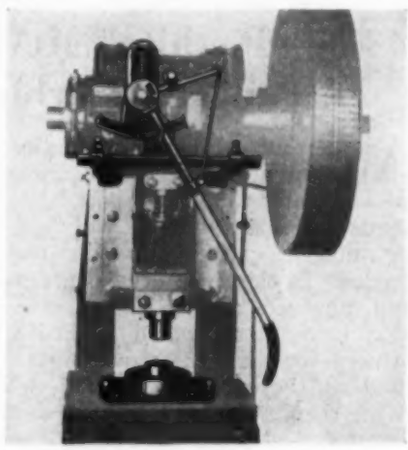
Principal dimensions are as follows: Distance from the end of bearing cap to end of spindle, $13\frac{1}{2}$ in.; distance between faces of inner flanges (standard), $51\frac{5}{8}$ in.; diameter of wheel flanges, $4\frac{1}{2}$ in.; total length over spindles, $62\frac{1}{2}$ in.; maximum thickness of polishing wheel, $3\frac{1}{2}$ in.; spindle tapped for taper points, $\frac{7}{16}$ in.; 16 threads per in.; height to center of spindle, 39 in.; area of base, 30x25 in.; net weight with 5-hp. motor, 1225 pounds.

Gardner No. 3-DA Double-Spindle "Speed-U-Need" Polishing Lathe

Wiesman Improved Safety Guards for Punch Presses

While accomplishing the same purpose as before, the improved safety guard for punch presses made by the Wiesman Manufacturing Company, 4th & St. Clair Sts., Dayton, Ohio, has been completely redesigned. Although the mechanism remains substantially the same, there have been changes made in the materials used for the various parts.

For example, the part of the mechanism that sweeps the operator's hand aside when the punch descends was previously made of wire held to the swinging mechanism by four screws and locknuts. In the present design a piece of second-growth hickory replaces the steel wire, which occasionally crystallized and broke due to the vibration of the machine and of the safety mechanism itself. This hickory stick is tipped with rubber where it contacts with the operators arm, should he leave it in the way when the punch descends. The upper end is inserted in a tubular socket and is held in place by two cotter pins. With this design it is easy to remove the swinging arm, and it is positively held in position.



Wiesman Improved Safety Guard for Punch Presses

Another part that has been redesigned is the sector piece carrying the recoil springs for the swinging arm. This was formerly made of cast iron, but has now been replaced by a pressed steel part.

The mechanism is simple in opera-

tion and consists essentially of a swinging pendulum arm actuated by a rocker arm that is driven from a rod bolted to the top half of the connecting rod bearing of the press. This rod is rigidly bolted to the connecting rod bearing through its cap screws and projects towards the front of the press. It engages the rocker arm of the safety guard through a U-shaped steel bearing piece that slides along and rotates on the arm.

This arm is tubular in form and is cast into a bronze bearing at one end. Previously it was cast into a cast-iron bearing which was subject to fracture. The use of bronze has lessened this danger, and in order to make a successful cast the steel tube is first bronze plated, whereas in the former design plain steel was used. This bronze bearing member which is about 3 in. in diam. is at the fulcrum point of the pendulum arm.

The design of the mechanism is such that when the punch has descended half way the guard arm has swung entirely across the face of the bolster plate. On the return stroke the guard returns beyond the punch when the ram is only half way up so that the operator can then insert his hand to remove the pressed part. The guard does not interfere with the operator who works the same as usual. It does not touch him in any way unless his hand is still on the die when the punch descends, in which case his hand is brushed swiftly to one side. The guard is made in eight sizes depending upon the size of press.

"Firthite" Mechanically-Held Tungsten-Carbide-Tipped Tools

AS A result of extensive cutting tests on steel, the Firth-Stirling Steel Company, McKeesport, Pa., has developed a new method of holding tungsten-carbide tips in tool shanks. In this type of tool a tapered tungsten-carbide blank, somewhat larger than would ordinarily be used for the same size shank, is fitted and keyed into a tapered slot in the shank. This is done in such a manner that a sufficient surface of the blank is exposed and may be ground to the proper angles, and offers sufficient cutting edge necessary for the depth of cut to be taken. The design is such that it is impossible for the tip to come out from any pressure resulting from the cutting. Furthermore, the tool shank acts as a protection from the chip as it curls over and sometimes strikes the side of the tip, causing chipping. A very thin copper sheet or plating is interposed between the contacting surfaces of the tungsten-carbide tip and the tool shank. This acts as a lubricant to permit a slight movement between the tip and the shank, caused by the difference in their expansion and contraction when successively heated and cooled. This interposed copper also acts as a conductor to transfer to the shank the heat generated on the tip by the cutting. The tungsten carbide used is "Dimondite," now renamed "Firthite."

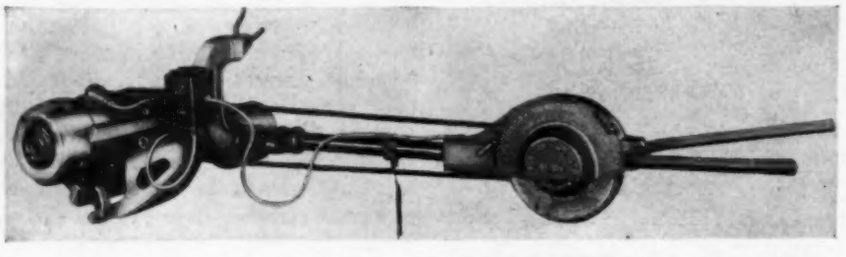
The failures that have occurred have been due for the most part entirely to tool design and construction, and clearly demonstrated the need of some method other than brazing or welding to fasten the tungsten-carbide tip to the tool whenever severe machining operations were to be undertaken. The heat generated under heavy cutting causes the brazing to soften, which permits the tip to slide and ultimately to come off. On the welded tip the difference of expansion between the tip and the tool shank becomes a decided factor, because of the heat generated under heavy cutting, and sets up such severe strains that there is a tendency for the tip to crack along the planes of contact with the shank. Neither of these faults is a factor nor of any consequence where the cutting is relatively light compared to the size of the tool tip.

The cutting tests conducted so far with these "mechanically held" tools have proved satisfactory in every respect. Failures due to tips coming off or cracking have been eliminated. The "mechanically held" principle will extend the use of tungsten-carbide tools to that field of machining heretofore considered too severe for brazed or welded tools, although well within the cutting capacity of tungsten carbide itself.

The test logs were 3.5 per cent nickel, 0.35 per cent carbon, steel forgings, 15 to 16 in. diameter, 8 to 12 ft. long, heat-treated to a minimum of 250 Brinell. A super high-speed steel tool, machining this log at a depth of cut of $\frac{3}{8}$ in., a feed of 1/18 in. and a speed of 60 ft. per min., broke down completely on an average of 10 min. The Firthite tungsten-carbide tools have been operated over a very wide range of depths of cut, feeds and speeds, the outside limit of speed being 1,500 ft. per min., with a 1/16 in. cut and 1/18 in. feed and the outside limit of depth of cut being 1 in. with a 1/18 in. feed and a speed of 60 ft. per min., the depth of cut of 1 in. being limited only by the capacity of the lathe.

Safety "200 Series" Swing-Frame Grinders

Three sizes of swing-frame grinders, Nos. 204, 210 and 205, respectively, have been placed on the market by the Safety Grinding Wheel & Machine Co., Springfield, Ohio. The wheel sizes taken by these units are 24 x 3 in., 20 x 3 in., and 16 by 3 in., respectively, the wheel holes being 12, 8, and 6 in. respectively. High-speed, organic-banded wheels for light or heavy work may be applied. A feature of the design is the safety interlock which requires



Safety "200 Series" Swing-Frame Grinder

the operator to change the sheave size to insure that the proper grinding speed for maximum efficiency is obtained as the wheel wears away.

Drive direct from the motor to the wheel by two V-belts is used, and control is through a pushbutton on the hood, which is of extra-heavy steel. Changing a wheel can be accomplished in five minutes by removing three wing nuts from the hood, lifting off the side of the hood, unscrewing a ring nut, taking off the adapter, and removing the wheel. The machine maintains its balance during this operation, the belt is not disturbed, and no crane is necessary, as no heavy lifting is involved. An a.c. motor is therefore employed, and stepping up the speed is obtained by changing the sheave size, three speeds being obtained on the No. 204 and two on the others.

Bryant Nos. 3 and 24 Hole Grinders—*Correction*

Through an oversight, the illustrations of the Nos. 3 and 24 hole grinders, manufactured by the Bryant Chucking Grinder Company, Springfield, Vt., were interchanged. To

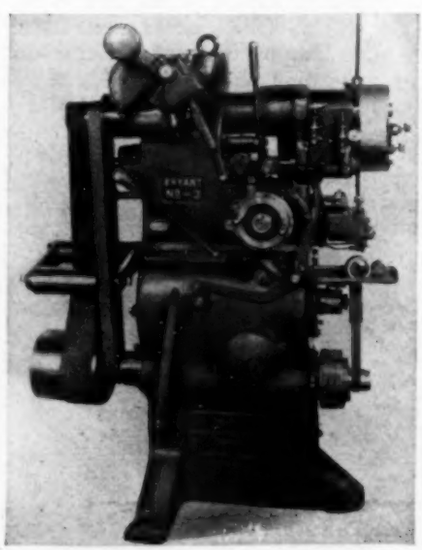


Fig. 1—Bryant No. 3 Heavy-Duty Semi-Automatic Hole Grinder

correct any misunderstanding, these illustrations are being republished herewith over the proper captions. The announcements in full were printed as follows: For the No. 3 unit, on page 519, Vol. 71, and for the No. 24 grinder, on page 489, Vo. 71, of the *American Machinist*.

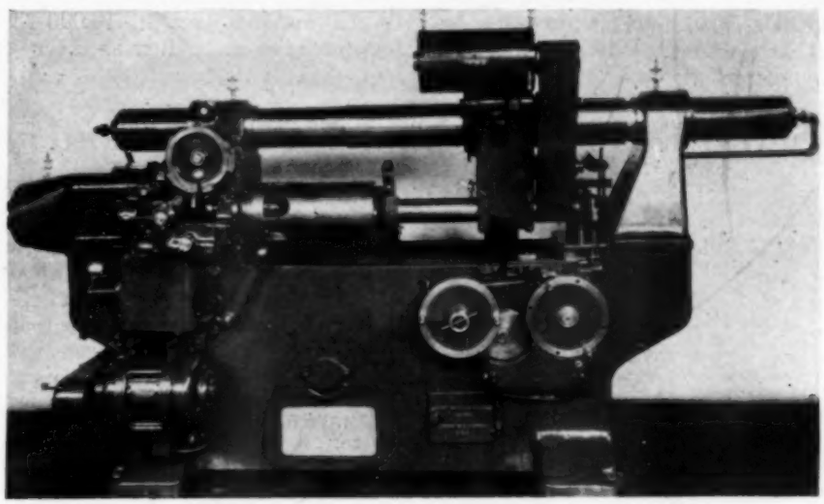


Fig. 2—Bryant No. 24 Deep-Hole Grinder

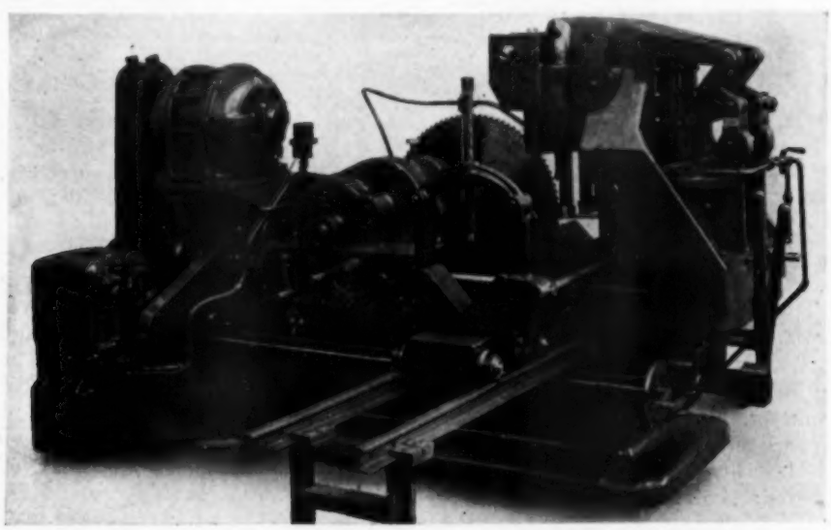
It will be recalled that the No. 3 heavy-duty grinder is available for grinding up to 2-in. holes, whereas the lighter model developed some time ago is limited to 1-in. holes. The stroke and swing remain the same, however.

The No. 24 grinder is a high-production type made in three sizes for swings of 21, 31 and 41 inches. It has a 14-in. stroke. The weights range from 7,000 to 8,000 pounds.

Cochrane-Bly Improved No. 66 Metal-Sawing Machine

CAPACITY to cut up to 10-in. round bars is found in the No. 66 metal sawing machine, announced by the Cochrane-Bly Company, Rochester, N. Y. The machine has Oil-gear feed, duplex, compound, toggle air clamps, and flood lubrication of the blade.

Specifications are as follows: Capacity, round bars, 10 in., square



Cochrane-Bly Improved No. 66 Metal-Sawing Machine showing the duplex compound toggle air clamp

bars, 9 in., I-beams, 12 in., rectangular sections, 8x12 in.; capacity 60-deg. fixtures for multiple cutting, ½-in. bars, 151; 2-in. bars, 13, and 4-in. bars, 4; saw blade, diameter and thickness 28 in. by ¼ in.; saw speeds, feet per min., 45-60-75; diameter of saw arbor, 5 in., diameter of saw collars, 7 in., speed of drive shaft, 450 r.p.m., feed range, ½ to 13 in. per min.; motor required, 15 hp., 1,200 r.p.m.; floor space, belt drive, 60x 104 in., and net weight, 10,000 lb. Motor drive may be furnished.

South Bend "New Model" Regular and Junior 9-Inch Lathes

BOTH the regular and junior "New Model" bench lathes announced by the South Bend Lathe Works, South Bend, Ind., are back-geared, screw-cutting engine lathes, differing only from the larger machines in the company's line in respect to capacity. They are strongly built, smooth running, and accurate. Both operate from the lamp socket, and will turn a 2-in. steel bar to 1½ in. in one cut.

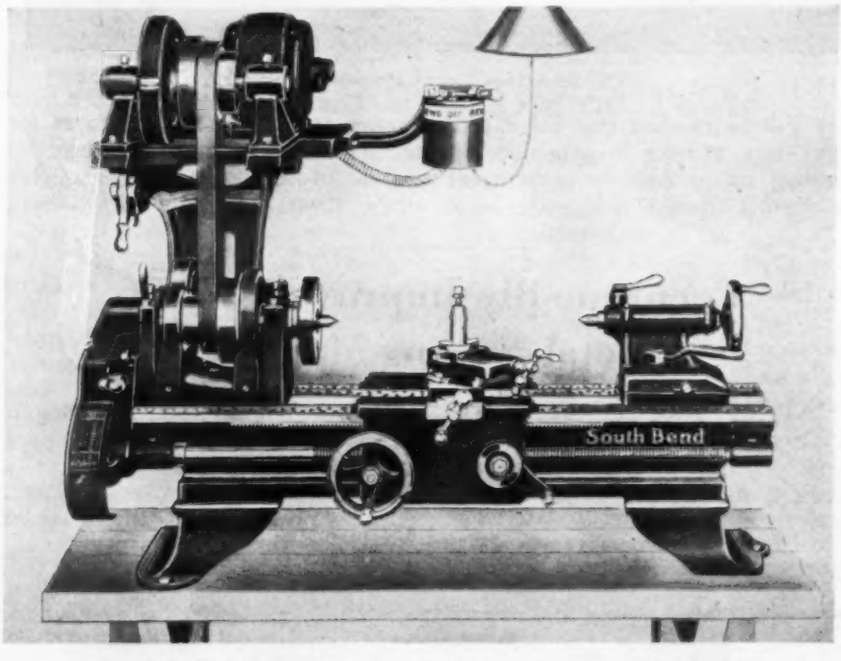


Fig. 1—South Bend "New Model" 9-Inch Junior Bench Lathe of the chain-driven type

The regular lathe has automatic cross and longitudinal feeds, a graduated compound rest for setting the cutting tool at any angle; a micrometer collar and cross feed screw for adjusting the depth of the cut to 0.001 per in.; a quick-acting latch reverse; six spindle speeds; a precision leadscrew for cutting 4 to 40 threads per inch, and a safety interlock to prevent accidental injury to the lathe. The unit is made in five styles of drive, several lengths of bed, and with bench, floor, or cabinet legs. It is intended for use in the toolroom, factory, repair and replacement shop, and the experimental laboratory. With several simple attachments, it becomes suited to grinding, milling, keyway cutting, and other operations.

The Junior bench lathe is illustrated in Fig. 1. The silent chain drive, consisting of a motor, inclosed, automatically lubricated chain and sprockets, and the jackshaft cone pulley are mounted over the lathe headstock entirely out of the way of the operator, chips and dirt, as shown in Figs. 1 and 2. They are carried on a substantial bracket supporting a tilting table, which carries the motor and provides easy belt shifting. Belt tension is adjusted independently of the tilting table. This machine also operates from a lamp socket and has same features as given above. It is made in several lengths of bed from

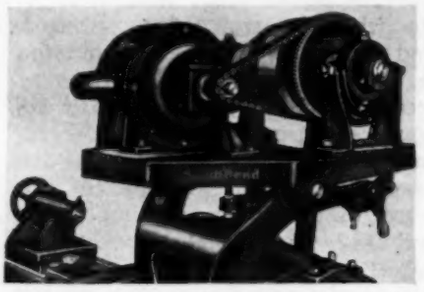
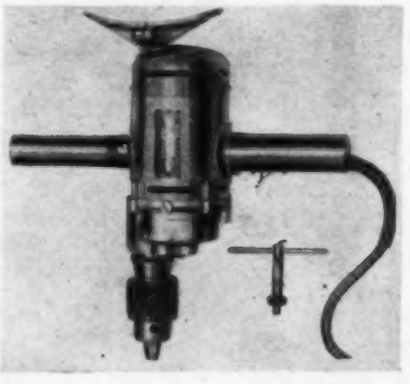


Fig. 2—Close-up of the mounting of the chain drive on the Junior lathe

2½ to 4½ feet, and can be obtained with either bench or floor legs. It is useful in the toolroom and factory, for making dies, master gages, and a wide variety of parts up to 9¼ in. in diameter.

"Speedway" Type 59 ½-Inch Electric Drill

Capacity to drill ½-in. holes in steel at 350 r.p.m. is embodied in the Type 59 drill announced by the Speedway Manufacturing Company, formerly the Electro-Magnetic Tool Company, 5 Great Jones St., New York, N. Y. The gear case has been so built that by a simple change of gears the tool may be provided with a varying range of speeds. A maximum speed reduction of 26 to 1 is possible. The motor housing is of drawn steel construction, which results in compactness and lightness.



"Speedway" Heavy-Duty ½-Inch Electric Drill

Equipment includes: Breast plate,

3-jaw Jacobs key-type chuck, extra side handle, 8-ft. rubber-covered cord with a soft rubber split plug connection, and a heavy-duty type, switch. The drill is available for use on 32-, 110- and 220-volt a.c. or d.c. circuits. The weight is 14 pounds.

Danly Die Sets

The Danly Machine Specialties, Inc., 2110 South 52nd Ave., Chicago, Ill., has recently brought out a complete line of large die sets. These consist of 4-post and 2-post rectangular die sets, 4-post square die sets, 2- and 3-post long, narrow die sets, together with heavy-duty guide posts and bushings for these sets. Altogether there are five different types and 85 different sizes.

Both punch and die holder are equipped with notches so that slings or lifting chains cannot slip. All edges are bevelled. One pin of each set is a quarter of an inch off center so as to prevent the punch holder being turned around inadvertently. All sets are equipped with removable guide posts so that the die may be ground without removal from the die holder. The long narrow die sets are equipped with bosses or pads for stripper bolts.

These large die sets are standardized and are practically a continuation of the company's "J" and "K" sets. They are useful for such purposes as automobile parts, farm implements, refrigerator cabinets, hardware, electrical equipment and laminations, and for work employing progressive dies where two or more operations are performed at one operation of the press.

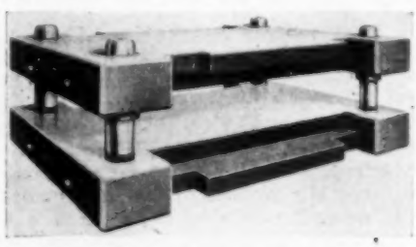


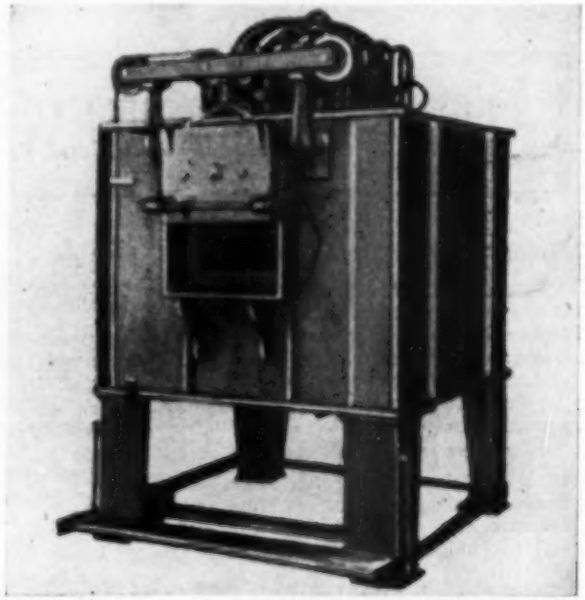
Fig. 1—Danly 4-post Rectangular Die Set showing hoisting notches

Fig. 2—Danly Long, Narrow, 3-post Die Set showing bosses for stripper bolts

Bellevue Type SV High-Temperature Electric Furnace

SEVERAL furnace units of the SV type, suitable for hardening high-speed and alloy steels at a maximum temperature of 2,500 deg. F., have been placed on the market by the Bellevue Industrial Furnace Company, 2971 Bellevue Ave., Detroit, Mich. These furnaces employ "Globar" heating elements placed vertically in two rows in the side walls and extending slightly below the hearth. The charge thus receives side heat principally. As the Globars extend partly underneath the hearth, which is supported on piers, part of their radiation is transmitted through the hearth plate insuring uniformity of temperature. Baffle plates are provided on both sides of the hearth to prevent direct radiation from the Globar elements to the charge. These baffles are detachable from the hearth plate and can be replaced conveniently by higher or lower baffles, depending upon the amount of direct radiation desired. The type SV furnaces are particularly suitable for uniform heating of tools held in vertical or horizontal position. They are recommended where an exceptionally deep hearth is required for heating long slender tools. The furnaces can be arranged for 110- or 220-volt, single-phase, or three-phase a.c. circuits or d.c. circuits. Other standard types of furnaces for heating flat pieces are also available in different capacities.

The units are of sturdy construction for continuous production requirements. The casings are of cast iron and the front is designed to avoid warping caused by radiation through the openings and from the hot face of the door. A special sealing mechanism which is equipped with rollers and wedges, thereby reducing friction to a minimum, keeps the chamber gas tight. The smallest size single-phase furnace has an effective hearth area of 8x16 in.; the largest size furnace has a hearth 16x28 in. in area.

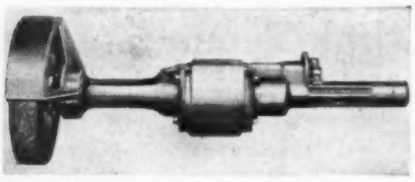


Bellevue Type SV High-Temperature Electric Furnace for heat-treating high-speed tools at temperatures up to 2,500 deg. Fahrenheit

"Chicago" No. 88 Rotary Grinder

The first of a line of "CP" pneumatic tools employing the rotary principle, the No. 88 rotary grinder has been placed on the market by the Chicago Pneumatic Tool Company, 6 East 44th St., New York, N. Y. The machine is available with two types of handles, either straight or pistol grip, and will carry an 8 x 1-in. elastic bonded wheel, or 6 x 1-in. vitrified wheel.

A four-vaned rotor rotates on a spindle in a casing having suitable openings for the admission and escape of compressed air. Even dis-



Chicago No. 88 Rotary Grinder

tribution of air upon the vanes assures efficiency. The simplicity of construction reduces the weight appreciably, with the result that the No. 88 grinder provides a high ratio of power per pound of weight. The grinder is governor-controlled, non-vibrating, and has a removable air strainer, heavy-duty radial and thrust ball bearing on the wheel end, a renewable, hardened rotor liner, and an automatic oiler in the rotor housing, with adequate grease plugs in the handle and gear case ends.

Standard equipment includes a 6- or 8-in. wheel guard, as specified, but no grinding wheels are supplied.

REVIEW · OF · RECENT · PATENTS

Relating to the Machinery and Metal Products Industries

Metal-Working Machines

Paul A. Pitman, of Quincy, Mass., has been granted patent 1,723,071 for a casting machine with a reservoir for holding liquid under pressure, a valve and flask, and means for opening the valve when the flask and reservoir are moved together.

Patent 1,723,112, granted to Franklin H. Wolever, of Chicago, Ill., deals with a sand-blasting machine having means for directing sand and chips into a pit and for inducing air flow through the machine.

Patent 1,719,238, granted to Erich Sander, of Gevelsberg, Germany, relates to a milling or drilling machine, having a table which carries radially-disposed cutter bars and chucks, and is rotated by friction between said bars and chucks.

Charles G. Johnson, of Bridgeport, Conn., has secured patent 1,723,622 on a grinding and polishing machine with a work support mounted for universal movement, and cam means for regulating the position of the support as it passes the wheel.

Patent 1,723,639, assigned to the Westfield Nut Co., relates to an automatic screw machine having a non-reciprocable work spindle, a reciprocable tool spindle, and other co-operating parts.

A facing machine with two concentric cutter heads, mounted on a carriage, and having individual drives, is the subject of patent 1,723,999, issued to James L. Bernard, of Beaver, Pa.

Processes

Patent 1,722,797, assigned to the Western Electric Co. deals with a method and an apparatus for applying and baking an insulating enamel coating on wire by drawing the wire successively through a bath of enamel and a heating chamber.

August Kadow, of Toledo, Ohio, has been granted patent 1,725,144, on a method of forming hollow articles, which consists in filling a mold with molten metal, allowing a shell of the metal, in contact with the mold, to solidify, and then emptying remaining molten metal by introducing gas under pressure.

A method of making gear sectors, and a blank therefor, are the subject of patent 1,724,957, assigned to the Wehr Co. The method comprises the forming of an annular ring integral with spaced webs which have independent hubs, cutting the teeth upon the ring, and then cutting the ring into segments.

Patent 1,725,379, assigned to the Gleason Works, relates to a method of producing gears by cutting one tooth-face by a reciprocating tool oscillated about one center, and simultaneously cutting the opposite tooth-face by a similar tool oscillated about another center.

John Bath, of Worcester, Mass., has been granted patent 1,725,246, on a method of making a thread die from a pre-finished and pre-hardened block. The method consists in grinding parallel grooves in the block as it is advanced axially.

To the Gleason Works has been assigned patent 1,725,037, on a method of forming bevel gears with a cutter having a constant correction-angle, independent of the spiral and dedendum angles.

Patent 1,724,894, assigned to the Kelsey Wheel Co., covers a method of forming brake drums from a flat blank, the web being made from sector-shaped portions.

TRADE PUBLICATIONS

DIE SETS. The Danly Machine Specialties, Inc., 2104 South 52nd Ave., Chicago, Ill., has published the sixth edition of its catalog and data book on die sets and die makers' supplies. This edition has been completely revised, to include the complete line of reverse die sets manufactured, together with additional sizes of laps, stripper bolts and bushings. A new type of shoulder, guide post or leader pin and bushing has been included. In the same cover is included a twelve-page booklet on large die sets. A chart in this booklet shows the various sizes and makes of punch presses which may be employed for the different sizes of large die sets.

MOTOR-GENERATOR SETS. Roth Brothers & Co., 1400 W. Adams St., Chicago, Ill., have published a folder showing a two-bearing type motor generator set, and a ball-bearing battery charger. The folder contains, four, illustrated, 11x$\frac{1}{2}$-in. pages.

PRECISION INSTRUMENTS. The Gaertner Scientific Corporation, 1201 Wrightwood Ave., Chicago, Ill., has published catalog M-130 on various precision instruments. Among them are micrometer eyepieces, slides and accessories, levels, standard meters and scales, comparators, and dividing machines.

INDUSTRIAL DENTAL SERVICE. The Metropolitan Life Insurance Co., One Madison Ave., New York, N. Y., a report entitled "Industrial Dental Service" which represents an exhaustive survey of dental dispensaries maintained by outstanding companies in the United States. It should be of use to concerns setting up such a department and offers suggestions to those now maintaining one.

REPORTS FOR EXECUTIVE CONTROL. The Metropolitan Life Insurance Co., Policyholders Service Bureau, One Madison Ave., New York, N. Y., has prepared a report entitled "Reports for Executive Control," which presents the methods used by progressive companies to meet the problem of executive control by supplying essential information in an attractive and easily assimilable manner.

WEIGHTS AND MEASURES. The American Institute of Weights and Measures, 33 Rector St., New York, N. Y., has published a large sheet listing the customary and metric units of weights and measures in an alphabetical listing which is of great convenience to the user.

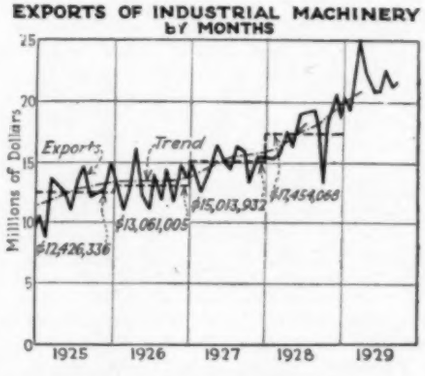
NEWS
OF THE WEEK

Exports of Industrial Machinery Gain 61 Per Cent in September

Foreign sales for first three quarters of 1929 exceed those for last year by 27 per cent

AFTER a decline in August, American industrial machinery exports took an upward turn in September, totaling over $21,500,000, or an increase of approximately $393,000 over the preceding month, according to L. J. Cochrane of the Industrial Machinery Division, U. S. Department of Commerce. As compared with September, 1928, when a sharp drop occurred, exports during the same month of this year show a gain of $8,180,000, or 61 per cent. However, a better idea of the steady growth in foreign demand for American industrial machinery may be gained from the figures for the first nine months of the year. These show that foreign sales of this commodity during the first three-quarters of the present year exceeded those made during the corresponding period of 1928 by 27 per cent and are now within striking distance of the entire volume reached during all of 1928.

Among the principal machinery lines, and with the exception of certain items in the power-generating group, foreign sales show substantial gains, both for September and for the first three-quarters of the year, as compared with the corresponding periods of 1928. These gains have been particularly notable in the case of metal-working machinery, internal combustion engines, conveying and construction machinery, mining and



quarrying machinery, well and refinery machinery, and power-pumping equipment.

Foreign sales of American metal-working machinery during the first three-quarters of the year have totaled nearly $31,000,000, as compared with $23,500,000 last year. September, moreover, has been a particularly heavy month, shipments abroad of this item amounting to nearly $3,400,000, or a gain of 17 per cent over August. The general trend for most items of this group is upward, but particularly noteworthy gains have been made in the case of lathes, gear-cutting machinery, sheet and plate metal-working machinery, forging machinery, foundry and moulding equipment, and pneumatic portable tools, while exports of rolling-mill machinery have more than doubled. Sales of a few items have fallen off, however, including particularly, vertical drilling machines, radial drilling machines, and external cylindrical grinding machines.

Among the miscellaneous machinery items, the trend is steadily upward. Total sales during the first three-quarters of 1929 exceed last year's business by nearly 30 per cent. Some items, such as tobacco machinery, paper and pulp mill machinery, woodworking machinery, air compressors, paint spraying equipment, and ball and roller bearings have made outstanding increases, while sales abroad of lathes, blowers, and ventilating machinery, refrigerating equipment, power-driven machines for commercial laundries, and iron and steel body valves have approximately doubled. A few other lines of machinery, have not fared so well. Returns at the end of September indicate a falling off in foreign business for bakery machinery, rice-mill machinery, brewers machinery, ice-making equipment, cotton gins, grinding and slicing machines, and sugar-mill machinery. For the last named, however, exports of cane-milling machinery have more than doubled and the decrease is due to a sharp falling off in sales of other types.

* * * *

Good Volume of Sales in Metal-Working Industries Predicted for Last Quarter

By R. M. Davis
Statistical Editor, McGraw-Hill Publishing Company

THE metal-working industry appears to be headed for a good volume of sales during the remainder of the year in the opinion of the 5,600 business men composing The Council on the Trend of Business conducted by *The Business Week*. Approximately 975 of these men are directly interested in the manufacture and distribution of metal products. In their opinion, the average volume of business during November, December, and January for the metal-working industry will be on a plane 4 per cent above that at the close of October, and 4 per cent over that of the same period last year. These men state that their volume of business at the close of October was 1 per cent above that being witnessed at the close of September and of proportions about 6 per cent over that at the close of October last year.

The volume of business at the close of October in the automobile industry, including the manufacture and distribution of cars, parts, and accessories, was on a plane about 4 per cent under that at the close of September, about 1 per cent over that at the close of September, and about 1 per cent over that at the close of October last year. The volume of business in other branches of the metal-working industry at the close of October was about 4 per cent above that at the close of September and 9 per cent above that at the close of October last year.

Taking American industry as a whole, the average volume of business during November, December, and January will be about 2 per cent greater than at the close of October, and 3 per cent over that of the same period last year. All sections of the country will show some increase over last year during the next 90 days — the East-North-Central and West-South-Central as much as 6 per cent, Chicago 4 per cent, and St. Louis 3 per cent. New England expects to do a volume of business 1 per cent under that of the same period of last year. This is the only section which expects a decresae.

Canadian general business in the next

90 days will run 4 per cent above that of the end of October, and, also, about 4 per cent above that of last year. A new impetus to general construction work is reported from all sections of the Dominion, but a serious congestion in grain storage is reported owing to the small export market.

The favorable agricultural outlook continues to dominate the general business horizon. The farmers, taken as a group, are optimistic for the first time in several years. While agricultural conditions are spotty, the outlook is better than it was at this time last year.

General employment continues on a high plane in practically all sections of the country. This favorable condition, with a background of high wages, provides the basis for a large consumer purchasing power. Several industrial centers, however, report a curtailment of operations in some of the leading industries.

Stock-market correction movements are acting favorably on the money market, making money available for general expansion purposes, especially in the construction of dwellings. A materially increased residential construction volume is expected in the immediate future. The local banks are calling back their funds from the New York call market and are making loans more easily available to their customers.

Low inventories continue to be maintained by distributors in general, but there appear reasons for believing that production in some lines is exceeding the demand. Some manufacturers have made the mistake of believing that the abnormal commodity demand of the summer months would continue during the remainder of the year.

Back of the factual situation is a general spirit of confidence and optimism which is prevalent throughout the nation. The psychological effect of such a feeling should go far toward keeping business on an even keel.

Most sections of the country report a seemingly gradual slowing down in general business. Few manufacturers expect to close 1929 on the same plane as that maintained during the first three quarters of the year. Some leading industrial groups, such as automobiles, paper and pulp, rubber products, and residential construction, are operating several per cent under the rate at this time last year.

* * *

Simplified Practice Acceptances Announced

Acceptances to simplified practice recommendations now in effect amount to 22,742, of which 21,488 are from individuals and 1,254 from trade associations, according to an announcement just made public by Ray M. Hudson, Assistant Director of the National Bureau of Standards, Department of Commerce. His announcement is based on a review of the activities of the Commercial Standardization Group of the Bureau of which he is in charge, for the third quarter of this year. The number of acceptances to commercial standards now totals 1,758. During the period, July 1 to Sept. 30, for which the review is made, there was a gain of 753 acceptances to simplified practice recommendations and 322 acceptances to commercial standards.

* * *

Welding Machine Companies Merge

A consolidation of the Thomson Electric Welding Co., Lynn, Mass., and the Gibb Welding Machine Co., Bay City, Mich., has been announced, the new company to be known as the Thomson-Gibb Electric Welding Co. Both plants will continue in operation. The Thomson company is one of the pioneer resistance-welding concerns, having been formed in 1886 to exploit the basic resistance welding patents of Prof. Elihu Thomson of Lynn, Mass. Professor Thomson has been an officer and director of the Thomson company and will continue with the new company in both capacities. The Gibb company has been one of the more active of the western companies specializing in seam welding. The consolidated company expects to place engineers for local service in the near future.

* * *

Officers for Blaw-Knox Subsidiaries Elected

J. R. Dunsford, vice-president of the Lewis Foundry & Machine Co., recently absorbed by the Blaw-Knox Co., has been elected vice-president of the Union Steel Casting Co., another Blaw-Knox subsidiary. He succeeds J. P. Allen, who continues as a director of the Blaw-Knox Co. Q. S. Snyder, vice-president and general manager of the Pittsburgh Rolls Corporation, has been elected president and director, succeeding the late D. L. Eynon.

* * *

Canadian Automobile Production Sets Record

Production in Canada's automobile industry in 1928 reached a new high record value of $162,867,495, as compared with $128,700,514 in 1927 and $133,598,456 in 1926. These totals include the value of cars, parts, and accessories produced during the year and also the amounts received for custom work and repairs made at the factory. In 1928, parts and accessories were valued at $12,949,249 and receipts for custom work and repairs amounted to $741,247. Automobile production alone also attained a new high record at 242,054 cars having a sales value f.o.b. plant of $149,176,000. This output was 18 per cent greater in number and 22 per cent higher in value than that in 1926.

Electrical World Publishes Annual Statistical Number

Electrical World, a McGraw-Hill publication, will publish on Jan. 4, 1930, a complete statistical reference book for the electrical industry. This book will bring to its readers a clear outline of the status of the industry at the end of 1929. Several thousand individual statistical items will be compiled and numerous charts will be used to present the data graphically. In addition to this, the data will be amplified and interpreted by those having an intimate knowledge of industry conditions in the various industries served by electricity. The record is not the product of *Electrical World* alone, but is the work of editors in collaboration with many nationally known contributors, including the U. S. Census Bureau, the Geological Survey, and the Utility Commissions.

* * *

Conference Approves Buff Simplification

A general conference of representatives of manufacturers, distributors, and users of buffing wheels, held on Oct. 7, approved a simplified practice recommendation in which the ordinary-size, full-disk, buffing wheels were selected as standards for stock items. The action of this conference resulted in a reduction from 17 different diameters to 11 standard sizes, corresponding to an elimination of 35 per cent of needless varieties. The conference also voted that 20-ply should be adopted as the standard ply for stock buffs, according to the Division of Simplified Practice of the Bureau of Standards, U. S. Department of Commerce. The recommendation is to become effective Jan. 2, 1930, for production on the new schedule and on Jan. 2, 1931, for the elimination of current stocks of non-standard sizes.

* * *

THE Quebec division of the Canadian Manufacturers Association has decided to press the provincial Government for exemption of machinery from assessment and taxation throughout the province. In other provinces, machinery is not included in civic assessments; in Quebec, with the exception of Montreal and one or two other cities where special charter rules apply, machinery is taxable. Thus, some manufacturers have plants in Montreal in which machinery is exempt and plants elsewhere in which machinery is assessed and taxed.

* * *

THE annual meeting of the international Acetylene Association will be held Nov. 13, 14, and 15 at the Congress Hotel, Chicago. The meeting will include sessions on aircraft, testing, structural steel, and welded pipe.

German Machine Builders Face Retrogression As Demand Drops Off

By Our Berlin Correspondent

THE German machinery business was flourishing until June, 1929. In July, a retrogressive movement set in, at first ascribed to the Summer season. As the Fall has brought no revival, conjecture has taken another course. The opinion is gaining ground that the slump is of a more lasting nature. Gloomy opinions regarding the near future prevail among members of the Society of German Machine Builders. The volume of new business is dropping from month to month, not in an alarming degree, but enough to cause builders to sit up and take notice. The Society checks business fluctuations by dividing the manufacturing members into three groups: The firms satisfactorily, those insufficiently, and those poorly employed; then comparing the movement between their numbers. The two last-named groups are now getting decidedly larger. The rate of employment, which in August was 70 per cent, dropped to 68 per cent in September. News of restricted working time and other measures of retrenchment is becoming more frequent every day.

Chiefly responsible for the drop is the increasing dullness of the domestic market. However, export business has not reached the size of that of June during any of the three successive months, a development which causes great anxiety, since foreign business is more than ever a factor of most vital importance to German machine building, best judged by the fact that export orders amounted in the third quarter of the current year to no less than one-half of the total of sales.

Nearly all branches of machine building are, according to the last report of the Society, affected by the retrogressive movement. The demand for machine tools has dropped perceptibly, it is declared. The demand for textile machinery, long suffering under the slump in which the German-textile industry is involved, shows no improvement whatsoever. Even the knitting machine business gives no sign of its customary revival during the Fall. The builders of agricultural machinery are planning an earlier commencement of their usual hibernation, the locomotive industry is sorely missing new orders from the State railroads and from abroad. Builders of power-generating machinery complain of dull business. Only the demand for Diesel engines is stated to be satisfactory. Orders coming from the iron and steel industry are insufficient and considerably lower than those in the first half of the year. The same applies to hoisting and conveying machinery. Only the makers of ore-dressing and disintegrating machines do not complain.

There is little doubt regarding the causes of the trend of business. All opinions point to a strong latent demand, held in bonds, however, by tightness of money and high bank interest rates. The same state of affairs prevails in other countries and is believed to be responsible for the decrease in export orders.

"The main sources of our money supply, America and England, are failing us," says the Society of German Machine Builders in explanation. "Although we in Germany, with our expanding industry, are feeling this perhaps most strongly, our best export markets are affected a good deal also. If present conditions do not change for the better, we foresee a strong reaction on the world's market."

Help from within is the only solution the Society can offer and the sole way out of the oppressing dependence on foreign money markets; meaning, of course, relief from the fiscal and other burdens which German industry has to carry. There is, however, no chance of lightening this burden, since the government has no intention of reducing taxes, and wages are still moving upward constantly. Some economists maintain that at least part of German industry exists solely on the strength of borrowed capital. The present development tends to corroborate this contention.

* * *

General Electric Sales Mount 24 Per Cent

General Electric sales billed during the first nine months of 1929, announced by Pres. Gerard Swope, amounted to $301,812,808.55, as compared with $242,676,762.07 for the corresponding period of last year, an increase of 24 per cent. Profit available for dividends on common stock for the first nine months of 1929 was $47,965,831.71, as compared with $36,910,649.96 for the corresponding nine months of last year. The profit available for common stock for the nine months is equivalent to $6.65 per share.

* * *

Organize Committee for Industrial Investigation

The "Committee of Twenty-Five" has been organized formally in New York City for the purpose of conducting fact-finding investigations into economic and industrial conditions in New York State, particularly in the northern part. The committee is the outgrowth of the New York State-Wide Economic Congress held in New York on April 17, 1929, at which consideration was given to the decline in manufacturing industry in New York and to the effect of changing economic conditions on the welfare of the people. This Congress appointed 25 representative business men and industrialists in the State, directing them to take cognizance of all that had been brought out during the Congress, to take such steps as might seem advisable to bring existing conditions to the attention of the people, and to suggest plans for improvement. The movement is similar to that undertaken by the New England Council and other industrial bodies in various economic areas of the country. James H. McGraw, Chairman of the Board of the McGraw-Hill Publishing Co., publisher of *American Machinist*, is a member of the committee which has already begun its investigation.

* * *

Machinery Conference to be Held Nov. 11

The Fourth Conference of Machinery and Equipment Associations will be held at the Chamber of Commerce of the United States Bldg., 1615 H St., N. W., 9.00 a.m., Monday, November 11. Among the subjects which will be considered at the conference are the following: Depreciation; Importation of Merchandise Bearing American Trade-Mark or Patent Notice; and Discounts on Motor Equipment. A study of the rates of depreciation of machinery and equipment was undertaken by trade associations on the suggestion of the Treasury Department, and has now been completed. The connection between the importation of merchandise bearing American trade-mark or patent notices and the pending Tariff Bill will be taken up and discussed. A third topic for discussion will take up the customs of the trade in regard to discounts on products sold to others engaged in the manufacture of products.

* * *

Calendar Reform Proposal Fails in Referendum

Proposals for calendar reform failed to receive the necessary two-thirds majority vote in a nation-wide referendum of business organizations included in the membership of the Chamber of Commerce of the United States. A preliminary canvas of the balloting, made public recently, shows that each of the three proposals put forward received a majority of the votes cast, but since the National Chamber can be committed only by a two-thirds majority, no decision was reached on any of the propositions. The suggestion that the United States should participate in an international conference to determine the form of changes to be made in the calendar received the largest affirmative vote. The proposal that the present calendar should be changed failed by the largest margin.

BUSINESS BAROMETER

Economic soundness and growth of the United States will not be disturbed by stock market collapse of last week

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

THERE can be no doubt about the economic soundness and growth of the United States. Neither of them will be seriously disturbed by what happened last week, but even those plants which grow most vigorously do not always grow constantly, and the greatest prosperity has its vicissitudes.

This is about the best explanation that can be offered for the collapse of the bull movement on the New York Stock Exchange and the other stock exchanges of the country. There is no likelihood whatever of its immediate resuscitation, but many well-seasoned securities are now to be had upon a basis that is attractive, and the investors opportunity has come as that of the speculator has passed. Trading on the New York Stock Exchange has reached a volume that would have seemed unbelievable two years ago, and it will probably continue large until most of the stocks held on margin have been redistributed amongst capitalists who have the money to pay for them. This process will probably take several weeks, after which a period of comparative quietude is due.

Next to their activity and the liquidation that it has reflected, the most important feature of the American stock markets has been the change in attitude toward common stocks that last week's quotations bespeak. Three or four years ago some American students of investment procedure surprised the world by undertaking to prove that common stocks of good corporations were worth more than bonds paying the same return. In support of this theory it was urged that the increment in a corporation's earnings or assets that accrued to the common stock more than offset the additional security afforded by the bonds, and that the way to wealth in the United States was through ownership of the shares known here as "common" and in England as "ordinary," even though they had to be purchased at prices on which their earnings would yield less than bond interest for perhaps two or three years to come.

While the stock boom lasted, the market seemed to recognize the validity of this theory, and those who acted upon it have profited largely if they got out in time. It is, however, unlikely that many of them were able to realize while the market was up, as the pertinacity of holders during a period of rising prices is one of the strange peculiarities of human nature. Be this as it may, the time is approaching when it may be practicable to buy good common stocks at a price that is equal to from eight to twelve times their annual earnings, which is a standard of value that long experience has demonstrated to be sound, and the quotation lists published in the daily papers should now be carefully scanned in an effort to discover opportunities of this sort.

Another widely accepted belief of the past two or three years which may now be re-examined is the philosophy of the "new era," which may be described as an assumption that business is now so stable and its management so skillful that depressions and panics are no longer likely. This assumption is neither wholly true nor wholly false. The fluctuations of the business cycle have been narrowed, but they have not been eliminated. Perhaps this will be better understood and more generally believed hereafter, for despite much whistling to keep up courage, it is idle to deny that the stock market decline which began early in September was accompanied and ushered in by a recession in some of the primary industries. Those affected include automobiles, steel, and building. In each case their output has dropped below that of a year ago and no recovery is to be expected immediately.

But the truth of the "new era" philosophy should be realized as well as its falsity, and there is little need to fear much further recession. Retail trade is at record levels, stocks of goods are generally not burdensome, money is easing and the bond market reviving. The outlook can, therefore, be called cheerful, although it may be some time before the recent peaks of production are reachieved.

The most significant immediate consequence of the stock market break is the easing of money. The discount rate of the New York Reserve Bank has been cut from 6 to 5 per cent, and the rate of the Bank of England from 6½ to 6. In brokers' loans in New York, the increases of four months were wiped out in a week with a record reduction of $1,100,000,000. But the decrease was entirely in loans of "all others" and of out-of-town banks, and the New York Member banks were compelled to increase their own loans a billion dollars to avert a money panic. Therefore some postponed liquidation may still have to be experienced, particularly in the "undigested securities." But this can not obscure the importance of declining money rates, which eventually will stimulate business again.

From this page the reader will get a quick picture of current business and industry. The boxed material below is a summary of the letters from regional correspondents of the American Machinist, published in full on the opposite page.

CONDITIONS in the machinery and machine-tool industry have changed little since last week. Most districts report conditions about as they were, but the Detroit area is becoming less active with dwindling production among the automotive concerns. Prices and deliveries are about the same, with some deliveries being bettered and some slipping off slightly. Demand is still for single tools for replacement or production changes, with no industry indicating extraordinary activity. The used-tool market is about as active as it has been, the demand being for modern used tools deliverable at once.

DETROIT conditions are worse than they have been for several years, with very few sales being recorded. Chicago reports an increasing demand for milling machines and increasing inquiries in other lines. Buffalo dealers expect October to show a larger volume of business than September, although the automobile and aviation industries are not buying. Milwaukee automobile production has been cut, but purchases by small machine shops are bringing up the total. Cincinnati conditions have shown improvement, and further favorable reaction is expected. New England machine-tool sales maintained the gains of the preceding week, with export sales continuing to be encouraging. Philadelphia demand kept up fairly well, with a slight slackening of inquiries in evidence. The New York market is considered healthy, and there have been no striking changes within the past few weeks.

Copyrighted
Theodore H. Price Publishing Corporation
95 Broad St., New York

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine-tool business

THE following reports, gathered from the various machinery and machine-tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

BUFFALO

There is considerable evidence at hand that October is going to show a larger volume in this district than did September. One or two dealers even go so far as to assert that October is going to be one of the best months of the year when the final figures are totaled.

Considerable business has been closed, particularly during the last few days, as a result of the Cleveland show. This month has proved that the Show genuinely stimulates business in the fall, and some dealers regret that it is to be held but once in three years hereafter. The end of the business as a result of the Show is not yet in sight.

There is little or no buying at this time in the automobile or aviation industries locally. The largest buyer at the present time in this district is the Bethlehem Steel Co. for the new mill.

CHICAGO

Conditions in the machine-tool market as reported by selling agents, manufacturers' representatives, and dealers show little variation from those prevailing for the last several weeks. An improvement in bookings is the exception rather than the rule, but machinery men in general are not disposed to complain about the present state of trade. Inquiries are being received in increasing number, and are for most types of standard shop equipment. Demand for milling machines is reported to be gaining. Lathes, shapers, and planers also are selling well. Small tools, the call for which has shown little, if any, diminution for several months, continue in good demand. No lists of any importance have recently been received from any source. Railroad buying is only for immediate necessities, inquiries for single tools predominating, which also applies to manufacturers of farm machinery and tractors. October business is generally declared to be on about the same level as that of September, with an increase reported in only a few instances. Dealers in used machinery are receiving many inquiries for tools in good condition. Little improvement is noted in deliveries. As a rule, confidence is expressed that business in machine tools during the remainder of 1929 will show an upward curve.

MILWAUKEE

Production of large-sized automobiles has been cut unexpectedly to a very low point locally and has had a greater effect than any other factor in lowering machine-tool sales below the anticipated mark. Aside from this, orders from the metal-working industries generally have been numerous enough to make certain that October totals will be much larger than those for the previous month or October, 1928. Small machine shops are buying more now than they have been for many months past.

Manufacturers of machine tools report no recession and only slight improvements in deliveries, but state that conditions further east are better than in this or the bordering states. There is, however, an unusually large amount of pending business in this territory and more than the normal number of inquiries from the manufacturers of electrical equipment, tractors, marine motors, and pipe. The most-sought equipment includes milling machines and small standard tools. The used-tool market continues very active.

For the first time in many months, there is a surplus of skilled mechanics, which is attributed largely to the slackness in the automotive lines and to an influx of workmen from other industrial centers. The credit situation remains good and apparently unaffected by the condition of the money market.

DETROIT

Sales of machinery and machine tools in the Detroit industrial area have dwindled to an unusually low level and there is little indication that conditions will improve in the near future. The market has been dropping off consistently for the past several months with only occasional upward trends. Within the past two weeks, however, the situation has become much more unfavorable, and at present there is almost no market for machinery of any kind.

A few dealers report sales, but these are small. Inquiries have dropped off and the trade is pessimistic as to the future. The motor car and associated industries are at an extremely low stage of production and there is nothing to indicate that conditions will improve soon. Only a few of the large plants are operating with anywhere near their normal payrolls and many plants, both large and small, have closed down entirely. There is a great deal of unemployment.

In some respects, the situation here is worse than it has been in several years and may grow worse after cold weather sets in. Machinery dealers have been receiving some hold-up orders and cancellations.

CINCINNATI

Market conditions in the machine-tool industry of the Cincinnati district have improved in the past few days. While the majority of the plants are busy, the delivery situation is normal, and, with few exceptions, orders for standard tools are being filled promptly. Extra time is required for filling orders for special tools.

Several manufacturers report that orders are beginning to come in as a result of the Cleveland Show, and further favorable reaction is expected. While no large orders have been reported from large users of tools, single purchases made up a good aggregate. The greater portion of the business booked in the past week came from the smaller users, including general machinists, contract shops, makers of metal specialties, and automobile repair shops. The business was well scattered.

Selling agents report that in local and adjacent territory business is holding up well, with a general upward tendency. The delivery situation is normal, and orders are being filled with reasonable promptness, the elapsed time depending, to some extent, on the type of tool purchased. Inquiries are increasing in number.

NEW ENGLAND

Machine-tool sales in this territory maintained the gains of the previous week. Machine builders and dealers indicate that the business volume of the month will not exceed September totals by any great amount. Improvement, however, is expected, as a result of the more brisk buying of the last two weeks of the month.

New business of the week was confined, for the most part, to orders of one and two tools. Inquiries are in good numbers, but lists on which closings were anticipated in October have been held over. New England railroads and the automotive industry are slow in resuming machine-tool buying; however, projected purchases are in the making. Beyond these two industries, orders for the week were from wide sources.

Foreign prospects and actual orders for export continue encouraging. Small-parts manufacturers give indications of buying. Presses and automatic screw machines were included prominently in the demand of the week, featuring the electrical industry. The non-ferrous industry is showing interest in drawing and mill-rolling equipment. Lathe buying has picked up notably during the past two weeks. Milling machinery, grinding units, and chains are selling steadily from this territory.

PHILADELPHIA

Demand for machinery and machine-tools kept up fairly well in the Philadelphia market during the last two weeks. Most of the dealers interviewed reported a slackening of inquiries, with indications that there will be a tapering off toward the end of the year.

One manufacturer dealing exclusively with the automotive trade reported there is a larger amount of business on the company's books now than ever before, and that the profits are reasonable. A sizable list of machine shop needs has been received in Philadelphia from the Norfolk & Western Railroad, and there has been some buying from Eastern carriers for replacement needs. There is a promising outlook for heavy equipment from general industrial lines, all within a radius of about 100 miles from Philadelphia. One producer of the equipment said the outlook now is better than it has been for some years.

The Victor Talking Machine Co. and the General Electric Co. have made some purchases in this market during the last two weeks.

Just now the business is somewhat ahead of what it was at this time last year. The falling off in inquiries and the reports that manufacturers do not see far ahead in orders were the weak spots of the reports coming from the Philadelphia manufacturers and dealers.

NEW YORK

Demand in the machinery and machine-tool business in New York is considered good, and the market healthy by most dealers of the district. No striking changes have occurred since the Cleveland Show and the resulting increase in interest. Most dealers expect October business to be about the same as that of September, and believe that there will be no startling changes until the first of the year and the issuance of new budgets. Buying is scattered and for single items, with no particular industries displaying interest. A few large orders were recorded during the week, among them a $35,000 order for equipment from a power concern, but the majority were for single tools for replacement or for maintaining production schedules.

Deliveries have not shown improvement as yet, except in isolated cases. Boring machine deliveries have dropped off slightly,

and radials, millers, and some lathes are also poor. There is talk of increased prices because of accumulated work, but no increases of consequence have been recorded for some time.

Generally speaking, the larger dealers selling standard lines are busy, while the smaller dealers handling less well-known lines report less business. The stock market crash has not affected business in the district, some dealers even anticipating increased business as a result of buyers withdrawing funds from the market and applying them to business. The used tool market is holding up well. One concern, the Triplex Machine Tool Co., reported sales of 8 Springfield lathes, 3 Campbell nibblers, an Ames bench miller, a metal bandsaw, a Racine hacksaw, and a bench drill press during the week.

* * *

McGraw-Hill Editors Tour Industrial New England

Editors of the 25 McGraw-Hill technical and trade publications, including Kenneth H. Condit and George S. Brady of *American Machinist* and *Product Engineering*, are making a 15-day tour of industrial New England for the purpose of becoming more closely acquainted with the latest developments in the district. The trip was arranged in co-operation with the New England Council, an organization of leading citizens of the New England states.

Communities visited by the editorial party are Stamford, Norwalk, Bridgeport, New Haven, Hartford, Waterbury, Meriden, Bristol, New Britain, South Manchester, and Thompsonville, Conn.; Boston, Cambridge, Springfield, New Bedford, Weymouth, Quincy, Worcester, Indian Orchard, Holyoke, Northampton, Greenfield, Chicopee, Salem, Beverly, Lynn, Gloucester, Watertown, Framingham, and Southbridge, Mass.; Battleboro, Springfield, Barre, and St. Johnsbury, Vt.; Keene, Berlin, Nashua, Manchester, Concord, and Gorham, N. H.; Poland Springs, Lewiston, Portland, Auburn, and Sanford, Maine; Providence, Pawtucket, and Harrisville, Rhode Island. The tour will end in Boston on Saturday, Nov. 9.

* * *

C. Schinz Returns To Switzerland

C. Schinz, of Zurich, accompanied by Mrs. Schinz, sailed for home on Oct. 31. While in this country, Mr. Schinz visited many of the manufacturers whom he represents in Switzerland.

* * *

APPROXIMATELY three times as much aircraft has been exported in the first three quarters of this year as during the same period last year, the value rising from $1,479,502 to $4,353,436. Export of engines during the same periods has gone from $446,500 to $1,127,090. The increase during this time in aircraft parts and accessories, excepting tires, has been somewhat slower, extending from $1,015,469 to $1,626,515.

"The Business Week" Says About the Stock Collapse

It DOESN'T Mean:	It DOES Mean:
That the real wealth of the country has diminished one nickel	That normal business expansion will be somewhat retarded for a while
That there will be any general or serious business depression	That business will have to go back to work
That stock prices will go back to the level of six years ago	That money will be temporarily easier
That common stocks will go out of fashion as investments	That there is no such thing as orderly deflation
That the "new era" illusion is dispelled	That banks and investment trusts cannot control the market
That the public is cured of speculation	That in the end business realities rule stock prices
That the Federal Reserve is to blame	That the public doesn't and won't believe it

Washington Looks at Machinery Exports—The High Cost of Repairs—Mr. Ford's Irish Tractors and the Tariff—Aircraft's Dull Season

By Paul Wooton
Washington Correspondent, American Machinist

WASHINGTON, D. C., Nov. 6—In a recent analysis of the export shipments going out of the port of New Orleans, foreign trade specialists of the Commerce Department report that they have been impressed by the predominance of machinery and industrial goods shipments in the South American trade. While nearly half of the shipments to the European countries were found to consist of agricultural products and crude materials, it was disclosed that 90 per cent of the trade with South America is made up of finished and semi-finished manufactured goods.

It is pointed out that there is every reason to believe that our industrial goods will be able to find additional outlets in South America when the completion of the inland waterway projects to the industrial sections around Chicago and Pittsburgh makes possible the bringing of goods to the sea at cheaper rates. In many cases, it is pointed out, heavy machinery and other heavy manufactured goods produced in the middle western United States cannot compete in South America with European firms when they have to pay the high rail freight charges to the Atlantic ports.

Complaint is rampant against the high cost of repairs, though it is held to be a natural outcome of an age of mechanization. As output increases, wages go up but prices go down. But higher wages must also be paid for repairs and other small-scale work. The result is that while the original cost gets lower and lower, the cost of repairs goes higher and higher.

Because of that situation there is a distinct increase in the purchase of higher grade, more repair-free goods. Mail order houses are guaranteeing washing machines for ten years. A refrigerator manufacturer advertises that no one yet has paid for repairs. Durability again promises to become the principal deciding sales factor.

When Mr. Ford gathered up his tractor plant from Highland Park and moved it over to Cork, Ireland, he reckoned without the tariff. Whether or not Congress can make it hard for Mr. Ford to do all of his manufacturing in Ireland and most of his selling in this country remains to be seen. There is no doubt, however, that Congress will do all it can in this connection.

The most important matter relating to the Cork tractor plant is in reference to the Ford company's proposal to build a similar plant in Russia. Russia and the United States are at present the only considerable users of tractors. Hence the strategic importance of the plant in Cork.

Efforts are being made to bring aircraft manufacturers and foreign trade experts of the Commerce Department together to devise means of developing foreign buying during dull periods in the domestic market.

Business Items

The Samson-United Corporation, Rochester, N. Y., successor to the Samson Cutlery Co., has recently purchased one of the larger plants in Rochester formerly occupied by the Selden Truck Co. The building is approximately ¼ mile long and covers an area of 6½ acres with a floor space of 200,000 sq.ft. The new plant will be equipped for straight-line production and will employ more than 500 people. The plant is served by a siding from the main line of the New York Central Railroad.

The Pacific Foundry Co., San Francisco, Calif., has announced the purchase of the property occupied by the Link Belt, Meese, & Gottfried Co. for approximately $100,000. The newly acquired property is improved with three, two-story brick buildings and is located within the block bounded by 19th St., Harrison St., Treat Ave., and 20th St., San Francisco, the greater portion of which is already occupied by the Pacific Foundry Co. The Pacific Foundry Co. plans to enlarge its plant at this location.

Articles of reorganization have been filed with the secretary of state in Indianapolis by the Jenkins Vulcan Spring Co. with a principal place of business in Richmond, Ind. The corporation has an initial capital stock of 2,070 shares of preferred stock having a par value of $100 each and 3,500 shares of common stock having no par value. The incorporators are Thomas B. Jenkins, Arthus L. Ellis, and Ernest L. Borradaile.

The Snap-On Wrench Co., 1270 So. Pierce St., Milwaukee, manufacturer of mechanics' tools, will move its plant and headquarters to Kenosha, Wis., A new plant costing approximately $150,000, with an additional investment of $125,000 in equipment, will be erected immediately on a 10-acre site on Twenty-ninth Ave., to be ready by Jan. 1.

The Pratt & Whitney Aircraft Co., Hartford, Conn., has opened a West Coast office in Los Angeles, according to an announcement by C. W. Deeds, secretary and treasurer. The new office, located at 716 Petroleum Securities Bldg., is in charge of E. B. Haines, an engineer from the sales department of the Hartford office, who will have charge of sales and service on the West Coast.

The Chicago headquarters of the American Cable Co., handling sales and service on Tru-Lay wire rope and Tru-Loc fittings in the Chicago region, have been moved to the recently completed Chicago Daily News Bldg. The former address was 160 North La Salle St.; the new is Room 1765, 400 West Madison St., Chicago, Illinois.

The Link Belt, Meese & Gottfried Co. is constructing a new plant, which will be ready for occupancy in about six months, located on Paul Ave., San Francisco.

The Chain Belt Co. has recently opened its 18th branch office at 950 Park Square Bldg., Boston, Mass., under the supervision of J. K. Merwin, formerly of the Cleveland, Ohio, office who will act as district manager.

Personals

HENRY M. KELLY, general superintendent of the United Engineering & Foundry Co., Youngstown, Ohio, has retired from active duty after almost 43 years of continuous service. E. E. CROSS, Cory, Pa., formerly with the Carnegie Steel Co., will succeed him. Mr. Kelly entered the employ of Lloyd Booth & Co., predecessors of United Engineering & Foundry Co., at the age of 19 as an office boy. He became assistant manager of the Lloyd Booth plant of the present company later. G. W. KNOTTS, also identified with the company for about 40 years, will continue as district manager at Youngstown. ROBERT MCGHIE, foreman of the Youngstown plant has resigned. His future plans are not announced.

T. P. BELLWIN has been appointed district representative in the states of Montana, Oregon, and Washington with headquarters in Seattle for the Marmon Motor Car Co., Indianapolis. MILES SMITH, who is succeeded by Mr. Bellwin in the territory, has been assigned to the factory sales promotion department. E. J. GRIMSHAW has been re-assigned as district representative in the state of New York with headquarters in Syracuse. All of the men have assumed their new duties.

A. T. NOGRADY has been appointed Autosan representative for the New York territory by G. R. Porter, manager of the Autosan Machine Division of Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn. Mr. Nogrady will cover, in addition to New York City, parts of New York State and the Philadelphia, Washington and Baltimore districts. He will work in connection with Russell Chico in covering the territory, both working from the New York office at 20 Vesey St., New York.

H. L. LIVESAY has been appointed factory manager for Kempsmith Manufacturing Co., Milwaukee, to succeed WALTER MICKELSON, who has been made manager of the Cleveland branch. GERALD G. TOLLIGER, formerly superintendent of the Evinrude Motor Co. plant, has been made production manager to succeed Mr. Livesay.

COL. HENRY COCKSHUTT, president of the Cockshutt Plow, and the Frost & Wood companies, has been appointed a director of the Bell Telephone Co. of Canada. Col. Cockshutt is also vice-president of the Adams Wagon Co., and a director of the Canadian Pacific Railway.

FORREST A. BOHNE, supervisor of six departments of the Delco-Remy plant at Anderson, Ind., was transferred to St. Catherines, Ont., Canada, about Nov. 1 to assume the superintendency of a new plant of the McKinnon Industries, Ltd., a subsidiary of General Motors. Mr. Bohne will have charge of the production of equipment used on General Motors automobiles made in Canada.

PAUL G. HOFFMAN, vice-president of the Studebaker Corporation, South Bend, Ind., has been appointed a member of a newly named committee of the U. S. Department of Commerce to investigate the best method by which municipalities may control traffic.

ALBERT J. SAMS, 28 East Jackson Blvd., Chicago, has been appointed exclusive railway sales representative for the Little Giant Co., Mankato, Minnesota.

GEORGE DUMBAULD, assistant treasurer of the Blaw-Knox Co., Blawnox, Pa., has been made a director of the company.

Obituaries

ALEXANDER L. SCHUHL, manager of the Philadelphia office of the Independent Pneumatic Tool Co., died suddenly of pneumonia, on Oct. 20, after an illness of only a few days. Mr. Schuhl was born in Philadelphia, May 25, 1884. After finishing school, he entered the services of Wm. Cramp & Sons Ship and Engine Building Co. as a machinist apprentice and worked there until he became foreman of the pneumatic tool room. Resigning in 1917, he joined the sales organization of the Independent Pneumatic Tool Co., and was appointed manager of the Philadelphia office in 1924.

ARTHUR F. HEGEWALD, 62, president and owner of the Charles Hegewald Foundry & Machine Co., New Albany, Ind., died Oct. 19 at his home in that city. He was sole owner and operator of the foundry, having purchased his brother's interest five years ago.

FRANK SOLOMON, formerly president of the Otto Gas Engine Works, died on Oct. 15 in Germany. Mr. Solomon was at various times connected with the Brown & Sharpe Manufacturing Co., Shuchardt & Schutte, and Alfred H. Schutte.

Forthcoming Meetings

FOUNDRY EQUIPMENT MANUFACTURERS' ASSOCIATION—Fall meeting in New York, Nov. 19. H. W. Standart, Northern Engineering Works, Detroit, is president of the association.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS — Annual meeting, New York, Dec. 2 to 6. Headquarters will be at 29 W. 39th St., New York City. Calvin W. Rice is secretary.

THE WEEKLY PRICE GUIDE . . .

Rise and Fall of the Market

DEMAND is turning toward steel structurals and railway material and away from automobile sheets, pipe and other forms. Sheet buyers, other than automotive, are taking material in the usual seasonal volume. Prices are steady in iron and steel but a trifle weak on scrap, owing to light buying in the automotive field. Plates have dropped 5c. to $1.90, Pittsburgh, in large mill lots. Uncertainty prevails in nonferrous metals. The stock-market break may affect lead for batteries particularly, in that it is likely to curb purchasing of automobiles and radios. Linseed oil is off 1c. per lb. (16.1c.), raw, 1 to 4 bbl., at New York.

(*All prices as of Nov. 1, 1929*)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b:

CINCINNATI	
No. 2 Southern (silicon 1.75@2.25)	$17.69@$18.19
Northern Basic	19.90
Southern Ohio No. 2	19.90
NEW YORK—Tidewater Delivery	
No. 2 Southern (silicon 1.75@2.25)	19.50
BIRMINGHAM	
No. 2 Foundry (silicon 1.75@2.25)	14.00@14.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.26@21.76
Virginia No. 2	24.04
Basic	19.75@20.25
CHICAGO	
No. 2 Foundry, local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 1.75@2.25)	20.01
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20 26
Basic	20 26
Bessemer	20.76

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.50
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.10@2.20	3.35	3.30	3.90†
No. 12	2.15@2.25	3.45	3.35	3.95†
No. 14	2.25@2.35	3.55	3.45	4.00†
No. 16	2.35@2.45	3.65	3.55	4.10†
Black				
Nos. 18 to 20	2.65	3.85	3.70	3.80
No. 22	2.80	4.00	3.85	3.95
No. 24	2.85	4.05	3.90	4.00
No. 26	2.95	4.15	4.00	4.10
No. 28	3.10	4.75	4.15	4.25
Galvanized				
No. 10	2.80@2.90	4.20	4.05	4.05
Nos. 12 to 14	2.90@3.00	4.30	4.15	4.15
No. 16	3.00@3.10	4.40	4.25	4.25
No. 18	3.15@3.25	4.55	4.40	4.40
No. 20	3.30@3.40	4.70	4.60	4.55
No. 22	3.35@3.45	4.75	4.65	4.60
No. 24	3.50@3.60	4.90	4.75	4.75
No. 26	3.75@3.85	5.15	5.00	5.00
No. 28	4.00@4.10	5.40	5.25	5.25

*Light plates. †Up to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt	53.74%	41.2%	55.5%	43.5%	55.5%	42.5%
3½ to 6 in. lap	50.32%	37.78%	53.5%	40.5%	51.6%	39.0%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
⅛	$0.17	1.315	1.049	.133
¼	.23	1.66	1.38	.14
⅜	.27½	1.9	1.61	.145
½	.37	2.375	2.067	.154
⅝	.58½	2.875	2.469	.203
¾	.76½	3.5	3.068	.216
⅞	.92	4.0	3.548	.226
1	1.09	4.5	4.026	.237
1¼	1.48	5.563	5.047	.258
1½	1.92	6.625	6.065	.28
2	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb:

Thickness—B.w.g. and Decimal Fractions		Outside Diameter in Inches—Price per Foot— ½	⅝	¾	⅞	1	1⅛	1¼
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.25†	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10†	5.30	5.00
Cold drawn, round or hexagon‡	3.60	3.65	3.60
Cold drawn, flat or square‡	4.10	4.15	4.10
Structural shapes	3.30†	3.00	3.10
Soft steel bars	3.25†	3.00	3.00
Soft steel bar shapes	3.25†	3.00	3.00
Soft steel bands	3.75†	3.65	3.65
Tank plates	3.30†	3.00	3.10
Bar iron (2.75 at mill)	3.25	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, $\frac{1}{16}$-in. thick. †Up to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse— $\frac{3}{32}$, 8.35c. per lb.; $\frac{1}{8}$, 7.85c. per lb.; $\frac{5}{32}$ to $\frac{1}{4}$, 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			19.25
Tin, Straits, pigs, New York			43.00@44.00
Lead, pigs, E. St. Louis	6.50@6.55	New York	7.62½@8.12½
Zinc, slabs, E. St. Louis	6.60	New York	7.75@8.25

	New York	Cleveland	Chicago
Antimony, slabs	10.50@11.00	11.50	14.50
Copper sheets, base	27.75	27.75	27.75
Copper wire, mill, base	20.12½	20.12½	20.12½
Copper, drawn, round, base	26.25	26.25	26.25
Copper tubing, base	29.25	29.25	29.25
Brass sheets, high, base	23.25	23.25	23.25
Brass tubing, high, base	28.25	28.25	28.25
Brass rods, high, base	21.25	21.25	21.25
Brass wire, high, base	23.75	23.75	23.75

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25@26	24.30	24.30
Zinc sheets (casks).....	11.50@12.00	12.25	10.11
Solder (½ and ½).....	30.75	32.75	31@34
Babbitt metal, delivered in case lots, New York, cents per lb:			
Genuine, highest grade.....			58.00
Commercial genuine, intermediate grade.....			43.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt.....			12.00

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	53.00	40.00
Tubing	75.00*	90.00†
Angles, not rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity offered for sale:

	New York	Cleveland	Chicago
Crucible copper.....	15.25 @15.50	13.50	13.00 @14.00
Copper, heavy, and wire..	14.25 @15.50	13.00	12.00 @13.00
Copper, light, and bottoms	12.75 @13.25	12.50	11.00 @12.00
Heavy lead.....	5.50 @ 5.75	6.25	4.75 @ 5.25
Tea lead.....	4.00 @ 4.25	4.25	3.75 @ 4.25
Brass, heavy, yellow.....	8.25 @ 8.75	8.00	8.00 @ 8.50
Brass, heavy, red.....	12.00 @12.50	12.50	11.75 @12.25
Brass, light.....	7.00 @ 7.50	7.50	7.00 @ 7.50
No. 1 yellow rod turnings.	9.25 @ 9.75	9.00	9.00 @ 9.50
Zinc.....	3.00 @ 3.50	3.25	3.00 @ 3.25

TIN PLATES—Charcoal—Bright—Per box:

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 14x20.....	$12.10	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb..	$0.13*	$0.16	$0.15
Cotton waste, colored, per lb..	.09½*	.12	.12
Wiping cloths, washed, white, per lb.....	.12½	38.00 per M	.16
Sal soda, per lb.....	.02½	.02	.02
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.161	.174	.165
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.65	.60	.65
Machine oil, medium-bodied (55 gal. steel bbl.) per gal..	.33	.36	.24
Belting — Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin. ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	35%
Med. grade, heavy wgt...	30%	30– 5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft:			
First grade.....	50%	50–10%	50%
Second grade.....	60%	60– 5%	50–10%

*Grade F.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb..	$0.0325	$0.033	$0.0325
Cold drawn shafting...	per lb..	.036	.036	.034
Brass rods.....	per lb..	.2125	.2125	.18
Solder (½ and ½).....	per lb..	.3075	.33	.3425
Cotton waste, white...	per lb..	.13	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No. 1, 6-in. dia.....	per 100.	4.60	3.60	3.59
Lard cutting oil.....	per gal.	.65	.75	.65
Machine oil.....	per gal.	.33	.33	.30
Belting, leather, medium.....	off list..	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs...	off list..	50-10%*	50–10%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$5.94	$5.94	$5.94
Emery cloth*.....	26.40	26.40	26.40
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.65	2.61	2.61
Cloth†.....	4.60	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton.....	Connellsville, 2.65@2.75		
Coke, prompt foundry, per net ton.....	Connellsville, 3.75@4.85		
White lead, dry.....	100 lb. kegs ...	New York, 13.75	
White lead, in oil.....	100 lb. kegs....	New York, 14.25	
Red lead, dry.....	100 lb. kegs....	New York, 13.75	
Red lead, in oil.....	100 lb. kegs....	New York, 15.25	

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	60%
Larger, up to 1 x 30-in., full kegs, list less.....	50–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	60%
Larger, list less.....	50–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.50
Structural, round head, broken kegs, net.....	6.00
Tank, 7/16-in. dia. and smaller, list less.....	60%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	60%
Larger, up to 3-in., list less.....	40–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$4.00
Wrought, broken kegs, per 100 lb., list less.....	2.00
Turnbuckles:	
With stub ends, list less.....	20%
Without stub ends, list less.....	50%
Chain:	
Proof coil, base, per 100 lb., net.....	$7.10
Cast iron welding flux, per lb., net.....	.40
Brazing flux, per lb., net.....	.80

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

D. C., Washington—A. L. Flint, General Purchasing Officer of Panama Canal, will receive bids until Nov. 11 for planing machine, drills, reamers, etc.

Mass., Boston — Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until Nov. 12 for drill press, engine lathes and motor operated sirens at Navy Yard here.

Mass., Boston—Merrimac Oil Burner Co., 123 Merrimac St.—one hp. electric motor multiple drill and tapping attachments.

Mass., Cambridge (Boston P. O.) — New Method Die Co., 30 Cross St.—circular saw, table, drill press 12 in. throat, and bench grinder motor attached 110-120 a.c., portable units, all large, also small jig saw.

Mass., Lynn—L. Barret, 25 Buffam St.—plating machine, etc.

Mass., Winchendon — Mason & Parker Mfg. Co.—Universal woodworker.

Mich., Kalamazoo—Checker Cab Mfg. Corp., Pitcher and Gibbons Sts.—equipment for body assembly plant and lacquer department for proposed 1 and 2 story, body manufacturing plant. Estimated cost $500,000.

Mo., St. Louis—Missouri Pacific R.R. Co., Missouri Pacific Bldg., W. A. Hopkins, Gen. Purch. Agt.—miscellaneous repair equipment.

O., Cleveland—Atlas Steel & Supply Co., M. B. Abrams, Pres. and Treas., 4402 Trumbull Ave.—10 ton electric crane.

O., Cleveland—Machine School, 2120 Prospect Ave.—lathe, 16 in. 8 ft. taper.

Pa., Parnassus—Logan Lumber Co., 3rd Ave. and 5th St., E. West. Mgr.—woodworking equipment for lumber mill destroyed by fire. $150,000.

Tex., Gruver—Gruver Roller Bearing Co., c/o P. F. Gruver, Pres.—machinery and equipment for the manufacture of bearings for proposed 50 x 100 ft. plant.

Ont., Paris—J. D. Adams Co., 217 South Belmont Ave., Indianapolis, Ind.—complete equipment for the manufacture of road machinery for recently acquired plant here.

Opportunities for Future Business

Ala., Huntsville — Electric Belle Range Co., awarded contract for a 2 story, 52 x 144 ft. enameling plant. Estimated cost $25,000.

Calif., Los Angeles—Northrop Aircraft Co., subsidiary of United Aircraft Corp., plans the construction of two units, 60 x 180 ft. factory and 30 x 50 ft. office at United Airport.

Calif., Modesto—Aircraft Industries Ltd., 935 East 14th St., Oakland, awarded contract for an airplane factory at Waterford Rd. Estimated cost $60,000.

Calif., San Francisco — Pacific Foundry Co., 18th and Harrison Sts., plans the construction of a foundry at 19th and Harrison Sts.

Conn., East Hartford—Chance Vought Corp., Long Island City, N. Y., awarded contract for a 1 story, 350 x 675 ft. airplane factory. Estimated cost $1,000,000.

Conn., Greenwich—McKeever Chevrolet Co., c/o Fletcher-Thompson Inc., 542 Fairchild Ave., Bridgeport, Archt., awarded contract for a 1 story, 60 x 200 ft. sales and service building on Post Rd., here. Estimated cost $75,000. Noted July 4.

Conn., Hamden—New Haven Road Construction Co., Inc., 70 College St., is having plans prepared for the construction of an engineering and utility building, etc., on Dixwell St. Estimated cost $42,000. L. J. A. Julianelle, 42 Church St., New Haven, Archt.

Conn., Hartford—Owner, c/o Abbott Mills, Brainerd Field, is having plans prepared for a 1 story, 100 x 120 ft. machine shop, hangar, etc. Estimated cost $50,000.

Conn., Seymour — Kerite Insulation Wire & Cable Co., awarded contract for additions and alterations to plant.

Conn., Stamford—Electric Specialty Co., 211 South St., had plans prepared for a 2 story, 45 x 145 ft. factory. Estimated cost $60,000. Private plans.

Conn., Stratford — Sikorsky Aircraft Corp., awarded contract for foundations for a 1 and 2 story, 200 x 250 ft. engineering laboratory. Estimated cost $250,000. Noted Oct. 24.

Ill., Chicago—Brasco Mfg. Co., 5035 South Wabash Ave., will receive bids about Nov. 1 for a 1 story factory for the manufacture of copper stores front. Estimated cost $150,000.

Ill., Chicago—Elkay Mfg. Co., 4710 Arthington Ave., manufacturers of sheet metal goods, awarded contract for a 1 story, 50 x 125 ft. addition to factory at 4706 Arthington Ave. Estimated cost $11,500.

Ill., Chicago—Kling Bros. Engineering Works, 1300 North Kostner Ave. (general machinists), awarded contract for a 2 story, 49 x 60 ft. factory. Estimated cost $24,000.

Ill., Chicago—W. J. Korber & Co., 263 North California Ave., awarded contract for a 2 story, 52 x 127 ft. machine shop. Estimated cost $34,000.

Ill., East St. Louis — Transcontinental Air Transport Inc., 915 Olive St., St. Louis, awarded contract for a group of airport buildings, including 1 story, 42 x 44 ft. torque building, 1 story, 50 x 101 ft. dope shop and 1 story, 120 x 213 ft. repair base building here.

Ill., Quincy—Local Syndicate, c/o Association of Commerce, Quincy, acquired a site and plans the construction of an airport including hangars, shops, etc., in Fabius Drainage District of Missouri, near here.

Ind., Evansville—A. L. Maxwell Co., awarded contract for the construction of a machine shop and garage at 9th and Locust Sts. Estimated cost $43,000.

Ind., Hammond — Nash Auto Co., awarded contract for the construction of a machine shop and garage at Holman and Doty Sts. Estimated cost $60,000.

Ind., Jasper—Hoosier Desk Co., S. G. Norman, Mgr., awarded contract for a 60 x 85 ft. factory. Estimated cost $42,000.

Mass., Belmont—J. Southwick, 433 Marlboro St., Boston, had plans prepared for the construction of a 1 story garage and repair shop at Trapelo Rd. and Flett St. Estimated cost $40,000. E. Nolte, 120 Monatiquet Ave., Braintree, Archt.

Mass., Beverly—City, S. H. Chace, Supt. of Schools, plans addition to high school, including manual training department, etc. Estimated cost $50,000. Architect not selected.

Mass., Chicopee Centre (mail Chicopee)—A. G. Spaulding & Bros., Centre St., Chicopee, awarded contract for addition and alterations to plant. Estimated cost $40,000.

Mass., South Dartmouth (br. New Bedford)—E. H. R. Green, Round Hill St., awarded contract for a 1 story, 100 x 120 ft. aircraft factory, 100 x 175 ft. hangar building, etc., at Rounds Hills Aviation field. Estimated cost $200,000. Private plans.

Mass., Springfield—Moore Drop Forging Co., 356 Birnie St., awarded contract for a 1 story, 95 x 180 ft. plant. Estimated cost $45,000.

Mich., Detroit—Detroit Show Case Co., 1654 West Fort St., awarded contract for a 2 story, 60 x 130 ft. factory on West Fort St. Estimated cost $45,000. Noted Oct. 24.

Mich., Detroit — A. Kahn, Marquette Bldg., Archt., is receiving bids for a 1 story, 135 x 320 ft. addition to wheel factory for Kelsey Wheel Co., 3600 Military Ave. Estimated cost $100,000.

Mich., Detroit—Wood Hydraulic Hoist & Body Co., 2924 Riopelle St., awarded contract for the design and construction of a 1 story, 50 x 130 and 80 x 190 ft. factory. Estimated cost $75,000.

Mich., Muskegon—Fitzjohn Mfg. Co., Central Ave., awarded contract for a 1 story, 90 x 100 ft. automobile body plant. Estimated cost $40,000.

Mich., Pontiac—Thompson Aeronautical Corp., Union Trust Bldg., Cleveland, awarded contract for the construction of a group of buildings, including 120 x 120 ft. hangar, 40 x 120 ft. shop and office, 26 x 91 ft. dope house, 20 x 36 ft. boiler house and 14 x 24 ft. engine testing house. Estimated cost $380,000.

Mo., Moberly—Guardian Aircraft Corp., 2504 Texas Ave., St. Louis, awarded contract for 1 story factory, including administration building, shops, etc. Estimated cost $40,000.

Mo., St. Louis—Herman Body Co., Clayton and Newstead Aves., awarded contract for a 1 story, 130 x 163 ft. factory at 4416 Clayton Ave.

N. J., Belleville — Westinghouse Electric & Mfg. Co., 150 Broadway, New York, is receiving bids for the construction of a 2 story plant here. Estimated cost $150,000.

N. Y., Buffalo—Sterling Engine Co., 1250 Niagara St., will soon award contract for addition to factory.

N. Y., Endicott—C. H. Higgins, 101 Park Ave., New York, Archt., will receive bids about Dec. 1 for the construction of a 4 story factory here, for Internaitonal Business Machine Corp., 50 Broad St., New York.

N. Y., Long Island City—T. Steele, 482 Vernon Blvd., plans a 99 x 217 ft. machine shop, at Vernon Blvd. and Rogert St., Van Wert & Wein, 347 Madison Ave., New York, Archts.

N. Y., New York — F. L. Smithe Machine Corp., 633 West 44th St., will readvertise for bids soon for the construction of a 125 x 181 ft. shop and office. Estimated cost $40,000. R. G. Cory, 30 Church St., Archt. Former bids rejected. Noted Sept. 12.

O., Alliance—Alliance Drop Forge Co., plans the construction of a 1 story factory. Estimated cost $40,000. Private plans.

O., Cleveland—City, R. L. Harding, Dir. of Public Service, City Hall, awarded contract for the construction of a 1 story, 80 x 180 ft. garage and repair shop at East 110th St. and Lever Ave. Estimated cost $100,000. Noted Oct. 24.

O., Cleveland — New York, Chicago & St. Louis R.R. Co., Terminal Tower, had plans prepared for the construction of a 1 story, 22 x 163 ft. car repair shop on East 55th St. Estimated cost $40,000. A. C. Harvey, Ch. Engr.

O., Cleveland—Wheeler Metal Products Co., E. F. Haflinger, Treas., 1637 Collamere Ave., awarded contract for a 1 story, 80 x 300 ft. factory. Estimated cost $150,000. Noted Oct. 31.

O., Medina—A. I. Root Co. (woodworking), awarded contract for a 1 story, 90 x 200 ft. factory. Estimated cost $60,000.

Pennsylvania—Rustless Iron Corp. of America, B. T. Brooks, Secy., 122 East 42nd St., New York, N. Y., plans the construction of a factory in western Pennsylvania or eastern Ohio. Architect not selected.

Pa., Bradford—Waddington Tractor & Equipment Co., C. E. Waddington, 17 Webster St., awarded contract for a 2 story, 30 x 60 ft. factory on Congress St. Noted Oct. 24.

Pa., Butler—Austin Motor Co., A. J. Brandt, Pres., 412 Stormfeltz Bldg., Detroit, Mich., is having plans prepared for addition to automobile factory. Estimated cost $100,000.

Pa., Johnstown—Bethlehem Steel Corp., plans extensions and improvements to steel mill, including new Bessemer department and open hearth furnaces. Estimated cost $10,000,000.

Pa., Oakmont—Edgewater Steel Co., W. A. McKean, Purch. Agt., is receiving bids for a 2 story, storage, manufacturing and testing plant. Private plans.

Pa., Philadelphia—Pattush Bros., Water and Wolf St., will soon receive bids for a 2 story, 115 x 250 and 45 x 200 ft. factory at Swanson and Oregon Sts. Pennsylvania Metal Co., 25th and Wharlton Sts., lessee.

Pa., Pittsburgh — K. Simon, 160 Fullerton St., had plans prepared for a 2 story, 45 x 65 ft. wagon shop. Estimated cost $40,000. A. R. Douglass, Benedum Trees Bldg., Archt. Noted June 6.

Va., Newport News—Horace E. Dodge Corp., had plans prepared for the construction of a group of factory buildings. Estimated cost $1,000,000. P. L. Small & Associates, Terminal Tower, Cleveland, O., Archts.

Wash., Bellingham—St. Paul & Tacoma Lumber Co., plans a $200,000 construction program, to include electrically operated sawmill, planing mill and shingle mill.

Wis., Milwaukee — Pressed Steel Tank Co., Greenfield Ave., awarded contract for a 1 story, 54 x 192 ft. factory.

B. C., Vancouver—Western Bridge Co. Ltd., J. A. McFarlane, Engr. and Mgr., Columbia St. and First Ave., is having plans prepared for addition to structural steel and fabricating shops. Estimated cost $400,000.